The Chemical Age

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Education—at which End?

IN the course of an interesting discussion in Liverpool, following an address on "Publicity" by the President of the Society of Chemical Industry, there were two short speeches which really touched the spot. Mr. J. Twomey, who knows much about industry, declared that there were all sorts of factories without chemists and the owners did not know that they needed chemists. Instead of chemists looking for work, manufacturers, he suggested, ought to be looking for chemists. Mr. Fell added that the object was not so much for chemists to educate one another through the journal as to educate the "upper ten" of the general public.

We have ventured more than once to say something very similar to this. The esoteric education of chemists by social and intellectual contact with one another is not unimportant; the only criticism is that the papers and subjects for discussion show a rather haphazard choice—excellent in detail but often leading nowhere in particular. If the societies selected definite problems for one whole session and arranged a series of progressive studies, the effect, we are sure, would be better. But internal education, necessary as it is, is quite different from the education of employers, managing directors, etc., in the value of organised chemical services. It is difficult to believe that industry has absorbed all the chemists it is capable of absorbing. The man of genius is always able to discover an enlarged constituency for any product. People probably thought before the Ford car appeared that the world had as many cars as it needed. The genius of Ford showed how badly mistaken they were. And what chemistry wants, and especially what the unemployed chemist wants, is the kind of genius which will rouse industry to the truth that it is not employing half as many chemists as it should, and show it how to begin employing them on sound lines. Here, indeed, is a fine field for chemical propaganda waiting to be explored.

The Mathematics of Water Gas

THERE is certainly one fact which the newly-formed Institution of Chemical Engineers has been able to demonstrate, and that is the capability of those who hold office to provide delightfully varied fare. Probably it might be argued that this is merely because chemical engineering really knows no boundaries, so that the number of subjects which can quite faithfully be brought up for discussion at the Institution's meetings extends almost to infinity. Thus far there has seemed, perhaps, to be rather a leaning towards theories and processes associated in some way or other with the technology of gases and fuels, but this may merely have been by way of compliment to the Institution's energetic president who, in whatever directions his ramifications may now extend, will always be claimed by the gas industry as one of its outstanding figures.

At the meeting held in London on Wednesday last the important subject of water gas came up for critical discussion, and it might be as well to say at once that Dr. M. W. Travers who introduced the subject, and who is well known as the co-inventor of the Travers and Clark complete gasification plant, ran some little risk of overwhelming his audience with a highly abstruse mathematical analysis of a subject which is essentially, so far as its technical-scale operation is concerned, under the control of practical men. We should be the last to disparage the value of Dr. Travers's deductions, or his attempt to add to our knowledge of the manner in which the water gas process can be built up. The only comment we have to make is that, valuable as his deductions may be as a written record,

there are possibly no more than half-a-dozen others who could attempt to enter the lists with him, and that the majority of his audience (who, presumably, were chemical engineers and not gasworks experts) might possibly fail to appreciate what particular mission he had in view. In the interests of the Institution of Chemical Engineers we venture to suggest, therefore, that they are not, perhaps, the most appropriate body for the discussion of an extremely specialised treatment of a specialised process which barely comes within the scope of chemical engineering.

In order to follow Dr. Travers's reasoning it is necessary to recall that recently experimental researches have been conducted, in connection with the water gas process, both by the Fuel Research Board and the Gas Investigation Committee of the Institution of Gas Engineers. Both of these bodies, each operating with different types of plant, published very complete data relating to the influence of various factors on the efficiency of gas production. A critical examination of the results made by Dr. Travers indicates that thermally the "blow" and "run" processes do not balance, and it is contended that there are three weak points in all investigations on water gas production which seem to account for the final discrepancy. Dr. Travers enumerates these as (*a*) failure to measure the amount of air entering the plant, (*b*) lack of means for recording loss of carbon during clinkering, and (*c*) inaccuracy of temperature measurements. The suggestion comes down, therefore, to this—that in compiling data and balances of the kind it is necessary to show, not merely how the total energy of the fuel is utilised, but also the relationship of the "run" and "blow" processes; and, if a balance is not then obtained, it is clear that the experimental results are at fault. The man on the spot will certainly agree with all this; but one is tempted to ask how the ordinary observer, with his own personal error, and handicapped with instruments whose practical accuracy is a long way short of Dr. Travers's dexterity with pound-molecules, can ever hope to arrive at the consummation of anything approaching a perfect balance. The majority of water gas manufacturers will continue, we feel, to be far more interested in considerations which might bring them a stage nearer a perfect balance sheet.

A Proposed Fertiliser Subsidy

ALTHOUGH the general question of Protection was not before the country at the General Election, unofficial suggestions have been made from time to time for helping this or that necessitous industry. In this class must be placed the letters in *The Times* by Rear-Admiral Lumsden and Mr. Charles H. Gardner, recommending that the British farmer might be assisted by a Government subsidy on artificial fertilisers. Our own view is that, except in quite special circumstances, industries flourish best on their own efficiency and initiative, without Government intervention or artificial aids, but some opinions we have received from a recognised authority on the British fertiliser industry are nevertheless worth consideration.

"At present," our correspondent writes, "it is universally acknowledged that artificial manures are not sufficiently used in Great Britain. It is well known that in France, Belgium, Holland, and Germany chemical fertilisers are used from three to five times as extensively per acre of arable land. This is certainly one of the reasons for the depression of British agriculture. The suggested subsidy on artificial fertilisers should commend itself to all interested in the welfare of agriculture on account of its facility of administration. There are very few vendors of either basic slag or sulphate of ammonia—the two manures which it has been suggested should be subsidised. It is, of course, out of the question that any but manures of British manufacture should be treated in this way. The subsidy could be worked simply through the agency of the few sellers of these commodities under the supervision of the Ministry of Agriculture.

"Many farmers complain that the price of artificial fertilisers is too high. As far as sulphate of ammonia is concerned, there is no justification for the complaint. In the year 1913 prices ranged from £12 15s. to £14 5s. per ton for ordinary quality (24½ per cent. ammonia). To-day, the price for neutral quality (basis 21·1 per cent. nitrogen and containing 25½ per cent. ammonia) is £14 6s. per ton delivered to farmer's station. Since 1913 the quality has been improved and prices are very little higher. Is this true of many other commodities? The increased cost of production has therefore diminished considerably the profits of the producers, and now many of them are producing at a loss. The subsidy, so far as it stimulated home demand, would reduce the exportable surplus of the producers and tend to strengthen the export market. It would be a simple matter for the Ministry of Agriculture to intervene in the home market to ensure that the subsidy reached the farmer in its entirety.

"Details of the method of applying the subsidy would have to be worked out carefully. The plan is clearly workable. The farmers would not only get the direct benefit of the subsidy, but they would gain in addition an increased knowledge of the value and necessity of chemical fertilisers. The gain to the whole community of a greater productivity of the soil, which would inevitably result from a generous subsidy of this kind, is evident. It is equally evident that the advantage would eventually reach the consumers of agricultural produce. And how little the subsidy would cost!"

Chemical Engineering Library

THE first series of booklets on chemical engineering, published by the proprietors of THE CHEMICAL AGE some two years ago, made clear a genuine demand for practical textbooks. These little volumes had a wide and ready sale, and opened up a field which it has now been decided to explore more thoroughly. The second series of "The Chemical Engineering Library," now issued by Ernest Benn, Ltd., consists of six volumes, at a uniform price of 6s. While still conveniently small, they permit of a fuller treatment of subjects than those of the earlier series, and already, we understand, they are selling well.

The subject of "Sulphuric Acid Concentration" is dealt with in two volumes by Messrs. P. Parrish and

F. C. Snelling. The first volume treats of concentration by hot gases, and the second, which will be issued shortly, will deal with concentration in heated vessels. In the volume on "Organisation of Production," Mr. John W. Curtis reviews this large question comprehensively and yet in a practical spirit. "Crushing and Grinding Machinery," by Mr. Hartland Seymour, is another practical volume on machines in common use for reducing materials to a fineness of about 10 mesh, and in a companion volume Mr. J. E. Lister similarly treats "The Screening and Grading of Materials." Under the title of "The Technology of Water," Mr. Alan A. Pollitt discusses both potable and industrial waters, and the problem of impurities. Altogether the series makes a notable addition to the rather limited literature of chemical engineering.

Degrees in Pharmacy

THE position and status of the pharmaceutical chemist in this country have long called not only for definition but for betterment. The increasingly rapid developments in organic chemistry, pharmacology, chemicotherapy, and the other branches of chemical and medical science, have opened up a wider field for the pharmacist. His responsibilities, already much greater than the general public appreciate, have been correspondingly increased. It is surprising how little the public know of the ways in which he safeguards and contributes to the general health of the community. They still regard him largely as a superior kind of shopkeeper—a position to a large extent forced upon him. Membership of the Pharmaceutical Society has, up to the present, been the sole qualification open to him, but the announcement is now made that the University of London is about to establish a course in Pharmacy leading to the degree of Bachelor of Pharmacy. This fresh opportunity for gaining greater academic distinction should prove a valuable factor in the attainment of a higher professional status. Perhaps, too, the new degree will serve in some way in clearing up the confusion which exixts in the public mind with regard to the distinction between the chemist and the pharmacist. The London University Senate are to be commended for taking the lead on behalf of the pharmaceutical chemists of the country.

Books Received

PRACTICAL ORGANIC CHEMISTRY. By Julius B. Cohen. London: MacMillan and Co., Ltd. Pp. 520. 6s. 6d.

A HISTORY OF BLEACHING. By S. H. Higgins. London: Longmans, Green and Co. Pp. 176. 10s. 6d.

THE CONSTITUENTS OF COAL TAR. By Percy E. Spielmann. London: Longmans, Green and Co. Pp. 220. 12s. 6d.

ELEMENTARY QUALITATIVE ANALYSIS. By J. H. Reedy. London: McGraw-Hill Book Co., Ltd. Pp. 134. 7s. 6d.

SCIENCE OF METALS. Z. Jeffries and R. S. Archer. London: McGraw-Hill Book Co., Ltd. Pp. 460. 25s.

ELEMENTARY QUALITATIVE AND VOLUMETRIC ANALYSIS. By William Caldwell. London: J. and A. Churchill. Pp. 418. 10s. 6d.

ALLEN'S COMMERCIAL ORGANIC ANALYSIS. Vol. II. London: J. and A. Churchill. Pp. 807. 30s.

COTTON CELLULOSE. By A. J. Hall. London: Ernest Benn, Ltd. Pp. 228. 30s.

CHEMISTRY AND ATOMIC STRUCTURE. By J. D. Main-Smith. London: Ernest Benn, Ltd. Pp. 222. 12s. 6d.

A COMPREHENSIVE TREATISE ON INORGANIC AND THEORETICAL CHEMISTRY. Vol. V. By Dr. J. W. Mellor. London: Longmans, Green and Co. Pp. 1004. 63s.

Points from Our News Pages

The colloidal study of soap is dealt with by Professor James W. McBain (p. 462).

Mr. A. T. Larson, of the Fixed Nitrogen Research Laboratory, in a paper deals with improved catalysts for synthetic ammonia production (p. 463).

Continental research is referred to by Mr. M. Briscoe, in an article on "Chemistry and Seed Treatment" (p. 465).

Dr. M. W. Travers reviews recent experiments in connection with the water gas process (p. 467).

Mr. W. J. U. Woolcock's speeches on "Publicity in the Chemical Industry" and "Experiments in Protection" are reported on pages 469 and 471.

Our London Chemical Market (p. 479).

The Scottish market report shows a little more activity in the heavy chemical market (p. 482).

The Calendar

Nov.		
10	Institute of Metals (Scottish Section): "An Outline of the Process of Casting in Bronze by the 'Cire Perdue' Method." C. E. Henshaw. 7.30 p.m.	39, Elmbank Crescent, Glasgow.
10	Ceramic Society: "Pinholes and Some Other Things." H. Plant. 7.30 p.m.	Central School of Science and Technology, Stoke-on-Trent.
11	Society of Chemical Industry (Birmingham and Midland Section): Papers by G. T. Morgan, H. M. Stanley, W. Wardlaw, F. H. Nicholls, R. L. Wormell, A. R. Bowen, and V. E. Yarsley. 7.15 p.m.	University Buildings, Edmund Street, Birmingham.
11	Sir John Cass Metallurgical Society: "Die Castings." A. E. Bidwell.	Sir John Cass Technical Institute, Aldgate, London.
11	Northern Polytechnic Institute Chemical Association: "Insulin." F. H. Carr.	Holloway.
11	Hull Chemical and Engineering Society: "The Story of Beverley Minster." F. Atkinson. 7.45 p.m.	Grey Street, Park Street, Hull.
12	University of London: Opening of the Ramsay Laboratory of Chemical Engineering by H.R.H. Prince Arthur of Connaught. 5 p.m.	University College, Gower Street, London.
12	Leicester Literary and Philosophical Society, Chemistry Section: "Water Supply." S. F. Burford. 8 p.m.	The Museum, New Walk, Leicester.
13	Chemical Engineering Group: Discussion on "Chemical Works Costs," opened by F. M. Potter, followed by H. C. Marris.	Kelvin Room Engineers' Club, London.
13	Institute of Metals (London Section): "The Oxidation of Metals, with Special Reference to Thin Films." Professor T. Turner. 7.30 p.m.	Royal School of Mines, South Kensington.
13	Cardiff Business Club: "A Business Man's View of Things." Sir E. J. P. Benn. 8 p.m.	D Park Hotel, Cardiff
13	Royal Society: Meeting at 4.30 p.m.	Burlington House, Piccadilly, London.
13	Optical Society: Papers by T. Smith and R. Kingslake. 7.30 p.m.	Imperial College of Science and Technology, South Kensington.
14	**Society of Chemical Industry and Chemical Industry Club: Joint Autumn Dinner.** 7 for 7.30 p.m.	Hotel Victoria, Northumberland Av., London, W.C.2.
14	West Cumberland Society of Chemists and Engineers: Discussion: The Motive Power of the Future. 7 p.m.	Workington.
14	Institute of Metals (Swansea Section): "The Inner Structure of Alloys." Dr. W. Rosenhain. 7.15 p.m.	University College, Singleton Park, Swansea.
14	Society of Dyers and Colourists (Manchester Junior Branch): "Studies in Liquid Films." Dr. R. S. Willows.	Manchester.

Some Notes on the Colloidal Study of Soap

By Professor James W. McBain

The following notes are taken from the address given by Professor McBain, of Bristol, before the British Association at the recent Annual Meeting in Canada.

SOAP is a unique material for the investigation of colloidal phenomena, because it illustrates nearly all the behaviour found in other colloidal systems, and it is one of the few reversible colloids which have a definite, simple, known chemical formula. Last and most important, all results with soap solutions are quantitatively reproducible, and, in the many cases where our results have been tested in other laboratories, the data have always been confirmed. We have been able to find one precise relationship after another, so that the results are almost lifted out of the colloidal field. Nevertheless, it remains true that soaps are typical colloids, and that the results are of general significance in determining the behaviour of colloids and their relationship to other states of matter. For instance, we have been led to a general, comprehensive classification of solutions.

Rate of Saponification

Soaps have been boiled according to the present ritual for over a century, the technique being handed down from generation to generation, almost unchanged and unexplained. Soap-boiling has never been subjected to any exact study, by either scientist or soap-boiler, the latter being essentially an artist, so that for exact information we have been dependent, to a large extent, upon data obtained in our own laboratory.

It is clear, from our studies, that quite half the time spent in soap-boiling is unnecessary, as only the last stages matter.

Apart from an earlier paper from our laboratory, there are no published data on the rate of saponification of oils and fats by aqueous sodium hydroxide. Lewkowitsch considered that the subject was not worth study, and others have preferred to depend upon the *a priori* mathematical speculations of Treub, which, however, are not confirmed by experiment.

We have used the hydrogen electrode as our tool for the study of the rate of saponification, as it has been found possible to obtain reproducible results in even such a discouraging medium as that of twenty parts of oil to one of aqueous solution.

We have been enabled to follow quantitatively the saponification of oils and fats, thus solving a difficult and long-outstanding analytical problem, and affording also a method for the study of the refining of oils.

As an illustration of the results obtained, it is found that the rate is strictly proportional to the concentration of the OH ion. We have devised a simple and easy method of integration, which gives a straight-line graph for such monomolecular dependence. Next, we find an unexpected dependence upon the amount of oil, in that the rate of saponification at first increases enormously, and then only slightly with further addition of oil. This shows that only that part of the oil which is finely emulsified contributes to the rate, and that most of the oil present is not in a fine enough state to do so appreciably. Treub had assumed that all the oil droplets would be of approximately the same size and efficacy.

Addition of soap increases the rate in still higher proportion, again showing that more and more of the oil becomes truly emulsified.

The other diagrams illustrate the effect of various additions of sodium chloride in the saponification of cocoanut oil. The data suffice to show that each factor can be quantitatively determined, and the reaction controlled accordingly.

Indicators

We decided to add another to the four independent methods of measuring the hydrolysis alkalinity of soap solutions, and turned to the indicator method. The hydrolysis alkalinity of soaps lies between N/1,000 and N/10,000, a higher degree of alkalinity than that usually studied by biologists, and most of their indicators were unsuitable.

As a preliminary study, we bought thirty different indicators advertised as suitable for use with alkaline liquids, and compared the colours obtained, using Sörensen's standard buffers of known OH concentration at 18° C. with those when pure sodium hydroxide solutions were employed.

The detailed results are complicated; for example, the Universal Indicator gives completely misleading results in this range. Only seven of the simple, and two of the mixed indicators, out of the thirty tested, read correctly at 18° C.

On turning to higher temperatures, where most of our former measurements were carried out, we found fresh reason to deprecate the modern jargon, which speaks of PH, instead of alkalinity. With four indicators, the so-called PH appears the same in cold and in boiling solutions of pure NaOH, which indicates that the apparent acidity is unaltered; or, in the stricter language of the chemist, the alkalinity has really altered about a hundredfold, because the dissociation of the water is correspondingly altered. The distorted result is due to the indicator.

With five indicators, neither PH nor alkalinity appeared the same at 18° C. and 90° C., and only three (namely o-cresol phthalein, phenophthalein, and thymol blue) indicated correctly at both 18° C. and 90° C. Even with these, the colour is dependent upon the concentration of the indicator. It exhibits a constant maximum within a certain concentration, and is less if either more or less indicator is added.

It is clear, then, that there are only three possible indicators for use with soap solutions at 90° C., and, by using two out of these three we were able to obtain the same results as by other previous methods. This now permits a systematic study of hydrolysis alkalinity and of the behaviour of acid soaps.

Forms of Soap

We now come to a description of the chief forms in which soap exists, and the conditions under which they appear. Many of these forms have been unsuspected, even by those who have spent their lives at the study or manufacture of soap. Although we have spent many years on the subject, very few days pass without our coming across some new and interesting fact.

The most useful thing for me to do is to attempt to describe the various forms in which soaps and their solutions can exist, remembering that there is a family likeness among soaps, whether pure or prepared from commercial oils; so that all of these states are assumed by any one soap, under appropriate conditions.

I shall group the forms under two headings:—Soap in solution, usually as a colloidal electrolyte; and soap which has crystallised out of solution. Taking the latter first, soap always crystallises out in hydrated form, the anhydrous salt having no interest. There are two distinct crystalline forms:—(1) The first consists of small, hexagonal plates, generally extremely thin, even when they cover an area of several square centimetres. This form is more usual in potassium soaps, but sodium soaps may assume it temporarily. These are pure crystals. (2) The second form is familiar in cakes of hard, white toilet soap. These are made of almost exclusively long, extremely thin fibres, which I term "curd-fibres," since it is they which give soap-curds their characteristic opacity.

Soap in solution is much more interesting, for it exemplifies the distinctive types of colloidal solution; and, on sufficient dilution, or at high temperatures, if hydrolysis is suppressed, it even forms clear, colourless, transparent, ordinary crystalloidal solution, like that of common salt. Possibly the most interesting discovery is that, in certain ranges of concentration, soap solutions are typical liquid crystals—that is, they are clear and transparent, are doubly refracting, and light up the field between crossed Nicols. They present the best material for the study of liquid crystals. These liquid crystals, (or anisotropic liquids, as I prefer to call them), are plastic fluids, but they are completely devoid of elasticity. It is a remarkable fact that soaps which are anisotropic are immiscible with isotropic solutions, and, in some cases, some time and trouble are necessary to dissolve them in water. Important commercial application has already been made of this fact.

We have found that all these colloidal systems obey the Phase Rule, in all external equilibria, with other phases.

Triangular diagrams have been constructed as the result of the study of nearly 1,000 different systems. There is a definite boundary of the field of concentrations, compressing isotropic soap solutions; likewise, anisotropic soap solutions occupy a definite region, and, similarly, curd fibres. Any of the equilibria of these processes may be read off from the phase-rule diagram. The definiteness with which these results are found is exemplified by the movement of the boundary lines of the field delimiting isotropic soap solutions with rise of temperature.

True Soap Jellies

Lastly, there is one particular state of soap solution in the middle of the isotropic field, which has rarely been seen by professional soap chemists—namely, true soap jellies. These jellies look like plastic liquid crystals, in that they are clear and transparent; but they differ greatly from them in two respects—they remain dark between crossed Nicols, *i.e.*, they are truly isotropic; and they are elastic, whereas the others are plastic.

These true jellies are identical in all their properties, with a fluid soap solution, under the same conditions, except that they are rigid and elastic. Great confusion is caused in the study of soaps and of jellies by men like Martin H. Fischer, who confound all these various states, and call them all jellies. Indeed, according to some colloid chemists, any gelatinous precipitate, a piece of wet blotting paper, a wet rag, or a beach of sand is called a jelly. There are two totally distinctive states of matter, whatever they are called—the clear, transparent, elastic solution; and the hard, white felt of fibres, which have crystallised out, and give an X-ray picture. It is high time that more care was taken in naming these different systems correctly.

Improved Catalysts for Synthetic Ammonia Production

The Development of Promoters for Iron Oxide

Although the general features and many of the technical details of various processes for manufacturing ammonia by the catalytic combination of nitrogen and hydrogen have been described at length, the catalysts employed have not been so freely discussed. Mr. A. T. Larson, of the U.S. Fixed Nitrogen Research Laboratory, however, in the article below, which appeared in "Industrial and Engineering Chemistry," indicates the more important practical developments so far as they are known.

As one reviews the history of the direct synthetic ammonia process he is struck with the fact that so many years of persistent effort were required before nitrogen and hydrogen could be made to combine catalytically. This is the more remarkable when it is observed that many of the essential features of the synthesis were recognised fully twenty-five years before any ammonia was actually produced. For example, in 1874 Clark suggested that ammonia could be made by passing nitrogen and hydrogen over metals such as chromium, manganese, iron, and cobalt. He held that the best results were obtained when these metals were in a finely divided or spongy state. Reduction of metallic oxides and the use of supporting materials were also recognised at that time as methods for improving catalytic action. And yet there is no evidence that Clark or any of his contemporaries ever succeeded in making any ammonia. In fact, there is no well-authenticated report that ammonia was ever formed catalytically until 1904, when Perman demonstrated that it could be produced by passing nitrogen and hydrogen over heated iron.

Theoretical Investigation by Haber

For some reason it has been less difficult to make ammonia by direct synthesis since 1900, for shortly after Perman's paper was published several investigators reported its catalytic formation. Of these Haber was probably the first to recognise that the commercial development of the direct synthetic ammonia process awaited the discovery of a suitable catalyst. This possibility seemed so remote in 1905, when he published his first paper on the ammonia equilibrium, that further pursuit of the technical aspect of the problem appeared to him useless. Fortunately, this reaction involved so much of academic interest that Haber continued his study of the equilibrium relationships involved. In the course of this work he investigated many contact materials, the most important of which were uranium, ruthenium, osmium, cerium, manganese, iron, and nickel. Of these, osmium and uranium gave the most promising results, osmium being reactive enough to give about 5 per cent. of ammonia, which Haber considered sufficiently encouraging to warrant him in following up the technical adaptation of the process.

Haber was fortunate in enlisting the active co-operation of the Badische Anilin und Soda Fabrik in the technical development of the synthetic ammonia process. As a result of their experience with the contact sulphuric acid process, they were particularly well equipped to contribute to the ammonia problem. It would be difficult to state precisely why earlier investigators had not succeeded; their failure was undoubtedly due, in part at least, to a lack of appreciation of the "poisoning" effect of certain gaseous impurities. In fact, some workers deliberately added substances—for example oxygen and water—which are now known to poison ammonia catalysts. The development of the contact sulphuric acid process by the Badische company proceeded rapidly after it was discovered that impurities in the gas, in this case arsenic, were accumulating in and gradually poisoning the platinum contact material. The difficulties in the case of the ammonia synthesis were not wholly concerned with gas purification; yet the experience of this company in dealing with the SO_3 synthesis must have been invaluable in the development of the catalytic ammonia process.

Industrial Development

It was about 1908 when the Badische Anilin und Soda Fabrik undertook the development of a catalyst which would serve the needs of the technical process. According to Bernthsen, thousands of experiments were performed on catalysts in the laboratories of this company. "The results of these experiments," he states, "finally established a sure foundation for the reliable synthesis of ammonia." The presence in Germany of synthetic ammonia plants having an annual capacity of 300,000 metric tons is sufficient evidence that these investigations produced at least one practical catalyst.

The publications of the Badische company and those of other investigators, which for the most part are contributions to the patent literature, have suggested about thirty different metals as suitable for the technical production of ammonia. There are also as many mixtures of these metals and their compounds which are claimed to make commercial yields possible. It would be unwise to venture the opinion that most of the catalysts suggested can never be of technical importance. As our knowledge of the mechanism of the reaction is extended new conditions of operation may result which will require contact materials differing markedly from those now employed. But as the process is operated to-day certainly most of these must be excluded either because of their scarcity or because of peculiar physical or chemical properties.

Catalysts Must Not be Too Readily Poisoned

If an ammonia catalyst is to be useful industrially it must not only be plentiful but it must also possess certain chemical properties which will enable it to produce ammonia while continuously exposed to traces of impurities such as oxygen, water vapour, carbon monoxide, and carbon dioxide, which are usually present in commercial nitrogen and hydrogen gas mixtures. This does not mean that catalysts operating under such conditions are expected to be as efficient as when exposed to highly purified gases. They must not, however, become permanently poisoned when oxygen or oxygen-carrying gases are present. The number of metal catalysts which are physically stable at the synthesis temperatures (usually 500° to 600° C.) and which at the same time are not permanently poisoned by oxygen is rather limited, being practically confined to iron and metals closely related to it, such as cobalt, molybdenum, and tungsten. Of these, iron is the only one that has been extensively developed.

Study of Promoters

Experiments made so far show that no one metal possesses all the properties desirable in a practical catalyst. Distinct improvements have been effected, however, (1) by mixing certain active metals, and (2) by adding small quantities of apparently inert substances to catalytically active metals. During the war extensive investigations of the first method were made in English, French, and American laboratories. In these experiments the best results were obtained with a mixture made up of equal parts of iron and molybdenum. Since cheaper and better catalysts can be prepared by the second method of activation, this iron-molybdenum combination has never been employed in the commercial production of ammonia.

According to Bernthsen, the Badische Anilin und Soda Fabrik was the first to study the effect of adding small quantitites of materials to an ammonia catalyst. Their experiments showed that the catalytic properties of iron were modified greatly by the addition of certain substances. They observed, for example, that sulphur, selenium, tellurium, phosphorus, arsenic, and boron were very harmful. On the other hand, certain substances, which they designated as "promoters," produced effects which were decidedly advantageous. Among these were oxides, hydroxides, or salts of the alkalis, alkaline earths, and the rare earth metals. The Badische patents mention about twenty-five elements, any one of which it is claimed will improve the catalytic properties of the iron.

The Fixed Nitrogen Research Laboratory began the study of ammonia catalysts in 1919. During this investigation the action of most of the promoters and poisons disclosed in the Badische patents was determined. These experiments showed that all the promoters suggested are not equally effective. In other words, it would not be desirable to select promoters indiscriminately from the generous number disclosed in these patents. Briefly stated, these experiments showed that the addition of oxides of aluminium, silicon, zirconium, cerium, or thorium produced better results than any of the other substances mentioned.

Mixtures of Promoters

This study of promoters also included an investigation of combinations or mixtures of various substances. Although there was nothing in the literature to indicate that combinations or mixtures of two or more substances would produce a better promoter for the iron catalyst, it appeared to be a logical course of experiment. The results of these experiments disclosed the fact that no single substance effected an improvement in the catalytic properties of iron even remotely comparable to that produced by a combination of two or more properly selected substances. If substances were not too closely related in their chemical properites—for example, a basic oxide and a relatively acidic oxide—there was a marked improvement in the catalytic activity of the iron. If, however, the substances were very similar—for example, sodium oxide and potassium oxide—the effect was indistinguishable from that produced when either one of these substances was used singly. The superiority of a properly selected multicomponent or composite promoter is evident from the following tests on three iron catalysts—one containing potassium oxide; a second, aluminium oxide; and a third, a combination of both oxides. These tests were all made under strictly comparable conditions at 100 atmospheres. The N_2:H_2 (1 : 3) gas mixture contained less than 0·001 per cent. of poisons. The space velocity was fixed at 5,000—that is, 5,000 volumes of gas (N.T.P.) per hour per unit volume of catalyst. In these tests the iron catalyst containing only aluminium oxide gave 8 per cent. of ammonia, while the one containing potassium oxide gave 5 per cent. When potassium oxide and aluminium oxide in the form of potassium aluminate were added to the iron, the resulting combination produced a catalyst giving 14 per cent.

It will not be possible to discuss fully the technical advantages to be gained from the use of an iron catalyst containing a composite promoter. Most of these, however, follow as a consequence of being able to operate the process at lower temperatures than are now used in commercial practice. Technical yields are easily obtained at 475° C., and under certain conditions the catalyst may be operated even at 450° C. At these low temperatures the longevity of the catalyst is appreciably increased. An obvious consequence of the increased reactivity of these new catalysts is a substantial increase in the production of ammonia without any further expenditure of energy for compression or circulation of the reacting gases. The larger amount of heat produced has considerably simplified the problem of heat interchange. The removal of the ammonia is also more easily accomplished. Even at pressures as low as 250 to 300 atmospheres enough ammonia is formed so that water-cooling of the gases condenses out of the larger portion.

Another noteworthy property of iron catalysts containing composite promoters is their ability to maintain a relatively high efficiency (fraction of the true equilibrium value) as the pressure of the reacting gases is increased. All other catalysts have been found to suffer a rapid loss in efficiency with increase in pressure, particularly at low temperatures. At 450° C. the pressure coefficient is so great in some cases that the additional ammonia produced will scarcely compensate for the added cost of compression. These new iron catalysts, however, can be operated at pressures as high as 1,500 atmospheres without suffering any appreciable lowering in the efficiency of conversion. Recent tests made at this pressure show that 70 to 80 per cent. of the gas can be converted into ammonia by a single passage through the catalyst.

Importance of Purity of the Reacting Mixture

The efficient operation of ammonia catalysts of the iron type at low temperatures demands a more complete purification of the nitrogen-hydrogen gas mixture than has so far been considered commercially feasible. Take, for example, the catalyst mentioned above which gave 14 per cent. of ammonia when operated on pure gas. If the gas had contained 0·03 per cent. of water the percentage of ammonia would have been reduced to 6. This characteristic behaviour in the presence of traces of impurities has appeared to be an effective barrier to the practical usefulness of these catalysts. Partial purification of the nitrogen-hydrogen gas mixture has been readily accomplished by the technical methods employed heretofore, but complete purification, which means the removal of the last traces of impurities, has not been commercially feasible on account of its great cost. It has been considered better practice to operate the ammonia process at higher temperatures, say, 550° C., where the effect of impurities is not so great. At these higher temperatures the differences between catalysts are not so apparent and the advantages of highly reactive catalysts, which are capable of operating at much lower temperatures, are not fully realised. Recently, however, a method of gas purification has been developed by means of which it is possible to obtain a gas of high purity at practically no additional cost. It is believed that this process will make possible the commercial operation of very reactive catalysts at their highest efficiencies.

Preparation of Catalyst

Since the properties of an ammonia catalyst of the iron type may be modified by the addition, intentional or otherwise, of small quantities of foreign materials, it is evident that the methods of its preparation must permit very close chemical control if the most active product is desired. Briefly stated, the preparation of an iron catalyst involves two steps: (1) the preparation of an iron oxide admixed with suitable promoters, and (2) its reduction by hydrogen. In this second step the nitrogen-hydrogen mixture prepared for the ammonia synthesis is usually employed. The reduction of the oxide involves no particular difficulty; the real problem lies in the preparation of the oxide mixture.

It will not be possible to discuss the various forms of iron oxides which might be employed and their methods of preparation. It is sufficient at this time to state that an artificial magnetite has been found to give the most satisfactory results. The problem of preparing an oxide is, therefore, one of fusing iron oxide and the promoter under such conditions that the chemical composition of the oxide mixture may be rigidly controlled. On account of the great chemical reactivity of fused iron oxide it cannot be melted in any crucible so far developed. Many refractory materials have been investigated for this purpose, but all have been found to contaminate the molten oxide. The method finally adopted consists in fusing the oxide in a protecting bed of the same material. The electrical conductivity of the oxide is sufficiently great so that the material may be melted between water-cooled iron electrodes. Promoters are readily added to the iron oxide in this method of fusion, and all those substances which are known to react unfavourably can be carefully excluded.

Chemistry and Seed Treatment

By M. Briscoe, B.Sc., A.I.C.

Reference is made in this article to Continental research in seed treatment and to the results of tests with organo-mercurial compounds.

CHEMISTRY is nowadays recognised to play so important a part in all phases of life that to comment on its importance in agriculture in particular would be almost a platitude. The layman is fully aware of the importance of manures and fertilisers, and the use in this respect of nitrates, phosphates, ammonium sulphate, etc. Further, the fact that plants are liable to diseases and parasites is almost equally a matter of common knowledge. In this connection we need but mention the use of weed-killer and the employment of solutions of chemicals such as copper sulphate for spraying plants to destroy pests. There is, however, a further aspect of the application of chemistry to agriculture which, though perhaps well known to experts in the specialised branch of the subject, has received but scanty publicity. That is its application to seed treatment.

Certain plant diseases, and amongst them the most violent, are left in the seed which is to be used for a future sowing. Such diseased seeds, if sown, produce a poor crop, a great portion of which is affected with the disease. Again, the seed-grain from such a sowing is contaminated and thereby already prejudicial to the health of future crops. Further, in some cases the disease may be actually transmitted to healthy plants already in growth by the diseased ones mingling with them.

It became early apparent that such diseases could be largely eliminated from the seeds if before sowing the latter were subjected to treatment with a solution of various chemical compounds. The two that found favour first were copper sulphate and formaldehyde. The diseases are many and various, but in the principal cereals are as follows :—

Wheat—Tilletia tritici and Fusarium.
Rye—Uroscytis occulta and Fusarium.
Barley—Ustilago hordei and Helminthosporium gramineum.
Oats—Ustilago avenae and kolleri.
Maize—Ustilago maydis.

These are commonly known as "Smut" and "Bunt" of various sorts for each cereal.

The Sprinkling Process

It was found that two methods of treatment were possible. In the first or sprinkling process the seeds are spread out on the floor and whilst being continuously shovelled and stirred a solution of copper sulphate (about 2 per cent.) or formaldehyde (about $\frac{1}{4}$ per cent.) is poured over them. The operation lasts about half an hour and the seeds are then spread out flat on the floor and covered with sacks for several hours and then allowed to dry. It is important that all flooring, sacks, sowing-machines, etc., should be treated with solution before use, as otherwise disease spores lurking in these may undo all the previous work. This method is simple and quick, but is liable to depend too much on the efficiency of the operator and the thoroughness of the work.

The Dipping Process

This process, also known as "Steeping" or "Pickling" is surer, though more laborious in its initial stages. A large tub is filled with the solution and in it is placed a basket lined with canvas or sacking material so that the solution flows through. The seeds are placed in the basket so that they are thoroughly immersed and are allowed to remain for a period of time depending upon the efficiency and the nature of the chemical used. The seeds are then taken out and dried and the level of liquid in the tub made up to the original by adding solution from stock. A second batch of seeds is then treated thus and so forth.

Defects of the Process

Farmers found that by using copper sulphate and formaldehyde they achieved vastly improved results with their seeds, and it became the general practice not to sow seeds without previous treatment with either of these substances. With the lapse of further time, however, it was found that these media did not give complete satisfaction. Firstly, the diseases were with moderate concentrations only partially destroyed. Secondly, the effect of even these moderate dilutions of chemicals was deleterious to the germinating power of the seeds. Further, if the concentration of the chemical and time in action were increased so that the disease was entirely eliminated, then the hindrance to germination was most pronounced.

Investigators on the Continent and in the U.S.A. set themselves, therefore, to find other and more efficient substances. In this country, however, no such praiseworthy steps were taken to any appreciable extent and endeavours seems to have been limited to testing various permutations and combinations of different concentrations of copper sulphate or formaldehyde and various periods of immersion. As a result, in this country it appears to be accepted that formaldehyde is better than coppr sulphate, and that when used in a concentration of about 1 in 300 for half an hour, the best results are obtained. It has also been found that the bad effects on germination can to some extent be countered by following up the formaldehyde process by a water wash or better still by a lime wash. The latter treatment has, however, the disadvantage that it unfortunately diminishes the germicidal power of the chemical.

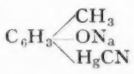
Results of Continental Research

The investigations on the Continent first proceeded on merely empiric lines in that various other copper salts were tried or mixtures of inorganic salts. One of these, Kurtakol, was a colloidal copper preparation manufactured by the Chemische Fabrik Kurt Albert at Biebrich a. Rhein. Corrosive sublimate was tried and, though effective, its general use could not be advised owing to its exceedingly poisonous properties. Various preparations, however, appeared in which corrosive sublimate was an ingredient. One of these, Fusafine, contained corrosive sublimate, sodium sulphate, common salts and an azo-dye. Two others, Weizenfusariol and Roggenfusariol, manufactured by Chemische Fabrik Fikentscher, Marktredwitz, contained corrosive sublimate, copper sulphate, and salt. Many of the large German chemical works gave themselves to this problem—it is noteworthy that most of the big German firms possess a department specially concerned with agricultural problems—and there have appeared at various times patented preparations, such as Corbin, Segetan, Tillantin, Trypaflavin, etc.

During this work, however, it became obvious that the fact that organic mercury compounds were so powerful in fighting the most pernicious of human diseases such as syphilis, etc., was not without bearing on the problem. What should be more likely, then, than that such organic mercury compounds would be equally effective against plant diseases? Moreover, it was discovered that mercury in organic combination actually promoted the germinating power of the crop. The problem, therefore, resolved itself into the discovery of such a suitable organo-mercurial compound.

One of the first of these bodies was a mercury compound of phenolsulphonic acid, but the two best known to-day are Uspulun and Germisan.

Uspulun is manufactured by Farbenfabriker vorm. Friedr. Bayer and Co., Leverkusen, and is stated to contain as its active principle a mercury derivative of chlorophenol. Germisan is manufactured by the Saccharin-Fabrik, A.G., vorm. Fahlberg, List and Co., Madgeburg-Suedost, and has the chemical formula



These two bodies have given remarkable results on the Continent. The diseases of seeds that are at all amenable to chemical treatment are completely eradicated and the germination of the seeds is not only not hindered, but is actually promoted. The cost per pound weight compared with that of copper sulphate or formaldehyde is high, but the increased yield, it is claimed, more than repays the additional outlay.

Results of Tests

The following are results obtained by one agricultural testing station with experiments on barley using the steeping process :—

TABLE I.

Treatment.	Average per cent. Germination.	Average per cent Smut Covered.	Loose.	Average yield in bushels per acre.
Untreated 1	77·9	14·2	5·1	33·8
Untreated 2	77·9	21·4	2·2	39·5
Formaldehyde 1 : 320 soaked 10 minutes	72·6	17·1	0·3	35·4
Uspulun 3 per cent. soaked 1 hour	82·8	Trace	Trace	38·3
Germisan 3 per cent. soaked 1 hour	82·7	do	do	44·7

Another series of results obtained with oats is as follows :—

TABLE II.

Treatment.	Average per cent. Germination.	Average per cent. Smut.
Untreated	84·7	4·35
Formaldehyde 1 : 320 soaked 10 minutes	73·7	0·18
Formaldehyde 1 : 320 soaked 30 minutes	30·0	0·0
Formaldehyde 1 : 320 soaked 30 minutes, washed with water	75·4	Trace
Formaldehyde 1 : 320 soaked 30 minutes, washed with lime water	78·1	0·0
Germisan 2 per cent. soaked 1 hour	94·0	0·0

The second table shows how a prolonged soaking in formaldehyde has an extraordinarily disastrous effect on the germination, which is partially overcome by subsequent washes with water, or better still with lime water. The first table gives actual figures for yields obtained per acre and shows the great superiority of the organo-mercurial compounds in even more striking detail.

In the United States several organo-mercurial products have been produced which have given great satisfaction.

The Luton Chemical Works Strike

THE strike of about 200 employees of B. Laporte, Ltd., chemical manufacturers, Kingsway, Luton, Beds, for increased pay and recognition of the National Drug and Chemical Union, shows at present no signs of settlement.

Mr. Arthur J. Gillian, general secretary of the Union, has issued a further statement to the shareholders of the company setting out the reply to the chairman of the company, Mr. H. E. Alcock, in which the men's decision to remain out until their demands are met is affirmed, and suggests a conference or arbitration. To this suggestion, Mr. Gillian says, there has been no reply.

Those employees who receive higher wages than 49s. are in a minority, says Mr. Gillian, and are called upon to do work of definite skill, responsibility, and extremely hard tasks, either heavy work or in great heat. Mr. Gillian says that the firm has not been asked to pay the rates operative in big industrial towns, and declares the men are not inclined to return to work.

Rubber Packing Problems

A REPORT of the technical conference held by the Rubber Growers' Association and the Research Association of British Rubber and Tyre Manufacturers in July has just been issued. Papers were read on "Plantation Rubber from the Point of View of the Manufacturer," by Mr. B. D. Porritt; "Research on Plantation Para Rubber," by Major B. J. Eaton, F.I.C.; and "The Ceylon Rubber Research Scheme," by the Hon. Mr. F. A. Stockdale. The full discussion following these papers is given in the pamphlet, and forms a valuable feature. The discussion turned largely on the problems of packing rubber for transport, the principal difficulties being that all sorts of rubbish would get into the rubber in transit, and that rubber packed in sheets would arrive in a solid block. The suggestion was made by several speakers that the last-named difficulty could be overcome by dusting with French chalk when packing.

Bricks from Spent Shale

An Interesting Process

IT is well known that one of the chief troubles in connection with the utilisation of shale, even in the case of very rich varieties as found in the Colorado, Utah, and Wyoming districts in the United States, yielding 60 to 80 gallons of crude oil per ton, is to find an outlet for the spent residues, which amount very roughly to something like 65 to 70 per cent. of the total weight. All kinds of methods have been suggested, and a vast aount of research work—especially in America—concentrated on the question, and the most promising possibilities would seem to be the use of the material as a fertiliser for agricultural land, in the preparation of cement and in the manufacture of bricks, the latter method in particular appearing to be very important.

The general principle is that of the ordinary sand-lime (calcium silicate) brick, consisting essentially of mixing intimately the ground shale residue with 5 to 10 per cent. of its weight of thoroughly slaked lime containing no trace of quick-lime, passing this through a brick-moulding machine operating at 2 tons per square inch pressure, and then subjecting the brick shapes in a brick or concrete tunnel to the direct action of steam merely at atmospheric pressure, that is, 212° F., for about eight hours. This results in an intensely hard brick, the action being primarily a combination of the lime with the free silica or acid silicates of the residue to give calcium silicates, which act as a binding material, something on the same lines—from a mechanical point of view—as in the case of cement in concrete.

A very interesting plant on these lines is being operated by the British Brick Co. of Philipstoun, Linlithgow, working with Broxburn shale residues, the installation having been supplied by Messrs. Sutcliffe, Speakman and Co., Ltd., of Leigh (Lancs.), who are one of the pioneers of the sand-lime and analogous processes for the manufacture of bricks from blast furnace slag and general furnace ash and clinker.

It may be stated that the average analysis of the shale residue is 5·38 per cent. carbon, 55·97 per cent. silica, 31·21 per cent. ferric oxide, 2·84 per cent. alumina, 0·59 per cent. lime, 1·87 per cent. magnesia, 0·62 per cent. soda, 5·06 per cent. sulphates (calculated as SO_3), and 1·07 per cent. moisture. The capacity of the complete installation is 24,000 bricks per twenty-four hours, the moulding machine discharging the shapes at the rate of 22 per minute, which are then packed on small trolleys holding 356 bricks and run direct into the cementing tunnels, of which there are four, each holding 12 trolleys one behind the other, giving therefore a total capacity of about 17,000 bricks.

The colour varies from dark blue to light red, depending on the character of the spent shale, and particularly whether there has been subsequent combustion in the moulds, which often happens since the product as delivered from the retorts has a considerable carbon content. However, the different coloured bricks are easily sorted out in practice, and they are of extremely high-grade quality, being equal or in fact superior to the ordinary burnt clay brick when subjected to all the usual chemical and physical tests. In this connection a very interesting report was published by Professor T. Hudson Beare, of the Edinburgh University, who made an exhaustive examination of these spent shale bricks. In general, for example, as compared with the burnt clay variety, there is little appreciable difference as regards water absorption, but the spent shale brick is superior both in cracking load and total crushing strain.

The matter is of particular importance because there is no question that sooner or later a very large portion of the liquid fuel of the world will probably be obtained by the distillation of shale, and it is for this reason that the United States Government have acquired vast areas of the richest shale bearing lands in the Colorado region, especially significant in view of the fact that at the present time they produce about 65 per cent. of the petroleum oil in the world.

Death of Dr. Koenig

THE death is announced of Dr. E. Koenig, the photographic expert of the Farbwerke vorm Meister, Lucuis and Bruning, Hoechst a/Main. Dr. Koenig, who spent practically the whole of his life in photographic research work, will be remembered in connection with the Pinatype process, sensitisers and desensitisers. He was an authority on three-colour photography and contributed to the German scientific ournals.

A Study of the Water Gas Process

Dr. Travers' Criticism

At a meeting of the Institution of Chemical Engineers held at University College, London, and presided over by Sir Frederic Nathan, on Wednesday evening, a paper was read by Dr. M. W. Travers, F.R.S., in which certain published results relating to experiments in connection with the water gas process were reviewed and criticised. The author dealt with the recent reports which were issued by the Fuel Research Board and by the Gas Investigation Committee of the Institution of Gas Engineers, and pointed out that it had been considered advisable to examine these data, particularly with a view to determining the influence of various factors on the efficiency of gas production.

In the two reports referred to, chemical and thermal balance sheets were used to show how the energy and material involved are utilised. Thus we have :—

Credits.	Debits.
Sensible heat of coke.	Sensible heat of water gas.
Latent heat of coke.	Latent heat of water gas.
Sensible heat of steam.	Sensible heat of blow gas.
Sensible heat of air.	Latent heat of blow gas.
	Sensible heat of waste, ashes, etc.
	Latent heat of waste, ashes, etc.

Something more than this was really required, for such a balance sheet merely showed that the energy of the coke, air and steam was being utilised in a certain way. What was wanted in addition was really what might be described as a trading account, which would show the relationship between the three distinct processes into which the water gas process might be subdivided—namely (*a*) the blow process, (*b*) the run process, and (*c*) the clinkering process.

In particular Dr. Travers pointed out that in general practice the ashes removed in the clinkering process were debited to the blow and run processes in proportion to the quantity of carbon consumed, so as to permit dealing with these processes independently. In the operation of water gas plant in actual practice, it was necessary, however, to take into account certain processes, some of which appeared generally to be lost sight of. Published chemical balance sheets invariably showed the amount of carbon removed from the plant during the clinker. This quantity, when subtracted from the total carbon supplied to the generator, was generally supposed to yield a measure of the total carbon gasified. The carbon gasified as water gas was calculated from the measured volume and composition of the water gas; and the difference between the total carbon gasified (assumed value) and the quantity of carbon in the water gas was taken to be the carbon in the blow gas.

Careful analysis of published results showed that quite a considerable loss might be incurred in the clinkering process through the combustion and loss of carbon which was not accounted for.

The total loss of carbon must obviously include two quantities, the actual carbon removed from the plant and the quantity consumed during the clinkering process. The latter was mainly converted into carbon monoxide by the draught of air entering the clinkering doors, the waste gases escaping through the stack valve.

After describing in detail his own method of applying calculations to the particular problem involved, the author pointed out that there were three very weak points in all investigations on water gas production, due to : (*a*) failure to measure the amount of air entering the plant, (*b*) lack of means of recording loss of carbon, and (*c*) inaccuracy in temperature measurements.

Dr. Travers concluded his remarks by urging that in studying the results of tests carried out on water gas plants balance sheets should be compiled showing, not merely how the total energy of the fuel was utilised, but also the relationship between the run and blow processes. If balance was not then obtained it was clear that the experimental results were at fault. Study of the published results of experiments showed that they were subject to error owing to inaccuracy in temperature measurements, and to the fact that, as no allowance was made for loss of carbon, otherwise than as ash, clinker, etc., the amount of carbon supposed to be gasified as blow gas appeared always to be too high. In order to extend our knowledge of the subject, experiments should be carried out in which one factor only was varied at a time. Thus, by keeping a constant depth of fuel bed, and changing the velocity of the blast, or by maintaining a constant blast velocity and varying the depth of fuel bed, we should obtain definite and valuable information as to the exact influence of these important factors. Measurement of the amount of primary air entering the plant would also serve as a valuable check on the consumption of carbon in the blow process.

Discussion

In the course of the discussion, Mr. J. G. King, of the Fuel Research Board, said the paper should initiate a considerable difference in the methods of tackling such problems as were found in water gas manufacture. Particularly he felt satisfied that Dr. Travers should have used the results given in one of the Fuel Research Board's reports for the working out of his theoretical considerations. The methods by which the volume of water gas was theoretically obtainable per ton of coke gasified were particularly interesting. In the example taken from the Fuel Research station data the water gas in Test No. 4 contained 3 per cent. more carbon monoxide than the standard gas chosen by Dr. Travers. This was certain to make some difference in the theoretical gas produced, and the difference would be still further increased by the fact that their own coke was lower in carbon content than 85 per cent., which was Dr. Travers' chosen standard. That consideration was bound to reduce the difference between his calculated volume of water gas and the Fuel Research Board's observed volume. The temperatures recorded by the Board would also be nearer to those occurring in the gas leaving the hot coke. Dr. Travers had referred to the Board's temperature as inaccurate ; but that was scarcely a fair statement, as the temperatures were supposed to be definitely those of the gas leaving the plant. They could not therefore be called inaccurate, because they did not measure the temperature of gases at another point of the system. The actual readings were taken with a thin platinum thermo-couple, and great care was exercised. He (the speaker) therefore was convinced that the temperatures were accurate to within a few degrees Centigrade of the conditions prevailing at the points of measurement. The Fuel Research Board's temperatures were taken with a view to measuring waste heat available for recovery ; no attempt was made to measure temperatures inside the generator, as each measurement was greatly complicated by effects of radiation from hot coke. No doubt Dr. Travers was correct in using the temperatures of the gas leaving the coke for his calculations of chemical composition, but it seemed that for the purpose of a heat balance the temperature leaving the generator must be considered, as any difference in heat content between the two points was taken up partly by the generator itself, partly by the flow of steam into the coke and partly by radiation. Mr. King said he hoped to make further use of Dr. Travers' work when next the Fuel Research Board made further experimental operations with its water gas plant.

Dr. Stuart Pexton said there was no question that water gas plants differed enormously in their output—even to so much as 10 per cent.—and he thought that Dr. Travers' paper would at any rate give some clue to tracing out where those differences were caused ; and those present were greatly indebted to him for pointing out the importance of the loss of carbon and its effect on efficiency during the clinkering period.

Mr. N. E. Rambush (Stockton-on-Tees) said that difficulty was sometimes experienced because different terms were used to explain the same scientific meanings, and he thought it was about time that gas engineers and chemical engineers and members of other engineering bodies tried to get down to some sort of standard of terms which should be put into common use. He thought that chemists and other scientific men in the United States were trained in the metric system ; several engineering works in England were employing the same method, and he considered that efficient calculation could be made with it.

Mr. J. S. Townend gave particulars of some experiments in blue water gas manufacture which had taken place at Birmingham, and said their object was to get the best results, especially as the water gas was used for town lighting. They found that the time taken in clinkering varied considerably with different kinds of coke. As to temperatures he thought the results obtained at Birmingham were certainly within

the limit of experimental error. Having regard to the importance of the problems, there was a definite field for further research. He thought that Dr. Travers' paper was important, especially in drawing attention to the loss of carbon during the clinkering process, and they were indebted to the author for his statement with regard to the quantitative examination of the serious loss of carbon.

Dr. Lessing said he thought that Dr. Travers was an idealist, and therefore sought to achieve ideal conditions. That was the right course to take, and those present ought to take him as an example, because only in that way could they march on the road of progress. Referring to the question of inorganic constituents in coal, Dr. Lessing said in any future tests which were bound to be made—and which in the present state of ignorance seemed to be necessary—still greater labour would be saved and better results attained if they could shut out the question of ash in the coke or reduce it to a minimum. The clinkering trouble would then disappear.

On the motion of Mr. C. S. Garland, a vote of thanks was accorded to Dr. Travers for his paper.

Value of American Dye Industry

Dr. C. H. Herty's Estimate

AMERICAN dye exports now reach the value of 18,000,000 pounds annually, while to-day fully 96 per cent. of American consumption is being supplied by the domestic industry, according to Dr. Charles H. Herty, president of the Synthetic organic Chemical Manufacturers' Association of the United States, who in a report of progress to the American Chemical Society asserts that in nine years " a modern miracle has been worked."

" It is difficult to give accurately the capitalisation of the industry," says Dr. Herty, " for in many cases it is impossible to decide what part of the capitalisation of a company should be apportioned to that side of its activities represented by the manufacturers of dye products." U.S. quality is fully equal to that of foreign products, he declares, and prices show a steady reduction. Research has been an important factor in the development of the last two years.

" Through a process of survival of the fittest, the number of manufacturers engaged in this work has now become pretty nearly constant," Dr. Herty continues. " The motley crowd which rushed into the field because of the enormously high prices with the great demand for products regardless of quality has been reduced to a substantial group of companies varying from the small manufacturer of two or three specialities to the largest with the most varied assortment of offerings. One of the most striking developments of the last few years has been the constant improvement in the quality of the products It should be a false pride which would deny the inferior quality of many of the products manufactured in the early days of the industry. While it is true that many of the troubles experienced in 1916 and 1917 were due to the wrong use of dyes, both American and left-over German stocks, nevertheless, fairness compels the statement that many of those American products were extremely faulty in their quality. To this point our manufacturers have given their especial attention, knowing that in the long run quality must decide. To-day consumers throughout the country bear willing testimony to the fact that the quality of American dyes fully equals those of foreign manufacture, and in many cases is better. There is probably no better illustration of the healthy working of Government protection than this industry affords, for it has received special protection from Government authorities, both administrative and legislative, because of the realisation of the bearing of this industry on economic independence, national defence, and public health. Those who early predicted that the industry would soon show a consolidation into a few large units, or perhaps one great unit in imitation of German organisation, missed their guess. The spirit of the Sherman Anti-Trust law has been kept inviolate. The industry, spurred on to intensive efforts to cheapen the cost of production and improve the quality of the products, has constantly advanced, and it is a just claim that consumers have gained the full benefit of these advances, for the Tariff Commission has been able to report each year a reduction in the average price per pound of dyes made in America."

French Chemical Industry Notes

[FROM OUR PARIS CORRESPONDENT.]

THE " Société Générale pour la Fabrication de la Dynamite " (General Dynamite Manufacturing Co.) reports a profit of 2,081,257 francs as compared with frs. 1,317,588 for the preceding financial year (ending June 30). The " Société Centrale de Dynamite " has also had a progressive year, the net gains having advanced from 1,549,470 frs. to 1,825,470 frs. The " Société des Produits Azotés " (nitrogenous products) made a gross profit of 3,995,061 frs. to April 30 last and after all deductions a balance of 650,465 frs. will be distributed in dividends, 6 per cent. going to the privileged shares and a sum of 17,941 frs. being carried forward.

The " Société d'Oxygene et d'Acetylene d'Extreme-Orient lost, according to the accounts of 1923, 80,985 frs., which general expenses, interest etc., bring up to 241,422 frs., as compared with a loss of 144,396 frs. in 1922. By revaluing its mobilisable accounts at average 1922 piastre exchange, in place of the reduced rate previously applied, a book supplement of net assets amounting to 680,291 frs. was realised, of which 241,422 frs. were utilised for the writing off of the above-mentioned deficit and the balance of 438,869 frs. carried to a special reserve account.

Scepticism Regarding Synthetic Petrol

Many competent critics are pessimistic with regard to the prospects of synthetic petrol. While not at all questioning the interest of the results obtained in the laboratory, they deny that the reactions are suitable for economic exploration. Professor Mailhe is quoted as a witness by the sceptics. He has practically admitted that under existing circumstances a given quantity of artificial petrol is only worth about half the price of the raw materials needed for its manufacture. M. G. Kimpflin has communicated to the *Journée Industrielle* some reflections on the industrialisation so confidently acclaimed as achieved. This authority declares : " The attempt to make synthetic petrol from acetylene is not novel. The National Powder Services, in particular, have studied this question with interest. At what price do you think have they estimated the kilogram of benzol made in this way ? At about 30 or 40 francs, perhaps ! Can a synthetic petrol be made to-day—I do not say cheaper than natural petrol, but merely 20 per cent. dearer ? Well, I say No ! " This profession of incredulity was backed up by reference to a scheme of twenty years ago when it was proposed to make synthetic ethyl alcohol with acetylene as the starting point. Scientifically the method was the great Berthelot's ; as such it was unassailable. Industrially it was another story.

The Prudhomme Petrol Process

Meanwhile a company is being formed to exploit the Prudhomme process and patents concerning synthetic petrol and all intermediate products. The Central Office is at 1, Avenue de Villars, Paris ; the capital 11 million francs. M. Prudhomme gives the company the exclusive licence for France and its colonies of all his inventions in connection with hydrocarbons and promises to sell to it for a million all his patents when the capital will have attained, by augmentations, 50 millions. The founder of the company, M. Houdry, receives shares in payment of different values including the plant of the Montigny factory where the industrialisation of the Prudhomme process has been accomplished.

Chemistry of Rock Formation

A GENERAL discussion is to be held by the Faraday Society on " The Physical Chemistry of Igneous Rock Formation " in the rooms of the Geological Society at Burlington House, London, on October 22, from 3 to 7.30 p.m. There will be two sessions, between which tea will be served. The chairman at the first session will be Dr. J. W. Evans, F.R.S., President of the Geological Society, and at the second, Professor F. G. Donnan, F.R.S., President of the Faraday Society. A number of papers will be presented, including one on " The Physical Properties of Silicate Glasses," by Professor W. E. S. Turner, one on " The Formation of Eutectic and Similar Structures in Silica Melts," by Mr. A. F. Hallimond, and one on " The Theory of Crystallisation in Rock Magmas," by Professor C. H. Desch, F.R.S. The meeting will conclude with an informal dinner at the Criterion Restaurant.

Publicity in Chemical Industry

The President's Visit to Liverpool

MR. EDWIN THOMPSON presided at the first meeting of the session of the Liverpool Section of the Society of Chemical Industry held at the Adelphi Hotel, Liverpool, on Friday, October 24, when there was a large attendance.

Lord Leverhulme's Gift

The Chairman announced at the outset that Lord Leverhulme, who was the Messel Lecturer at the Annual Conference recently held in Liverpool, had given his fee of £50 as lecturer to the Liverpool Section for a prize for a student at Liverpool University. The £50 had been given in shares in Lever Bros., Ltd., and would yield £10 per annum, which could be used for the purchase of books or other material required by the successful student. It was agreed that the thanks of the Section should be sent to Lord Leverhulme for his gift.

In introducing the President of the Society, Mr. W. J. U. Woolcock, the Chairman said the subject chosen, "Publicity in Chemical Industry," was a thoroughly interesting one, and it had been the feeling of the Section that they should make their meetings as interesting as possible, and that they should not be merely of a technical character.

Mr. Woolcock's Address

Mr. Woolcock, proceeding to deal with the position of the Society and its functions with regard to publicity in Chemical Industry, said that its position was unique among the organisations representing chemical science and chemical industry in that it represented both the scientific and the industrial sides of chemistry. This position presented very great opportunities for usefulness, and the influence which might be exerted by its five thousand members was of great value to the community. Its responsibilities, therefore, were extremely heavy, and at the moment were not being shared fully among all the chemists and industrialists engaged in the industry.

He then dealt with the financial position of the Society and gave an account of the internal working of the Society's affairs. At present, owing to the depression in the industry, the burden of carrying on the various societies to which chemists belong was becoming intolerable, and steps were being taken to co-ordinate the work of the societies to prevent overlapping and to reduce expenses. In this connection he instanced the co-operation between the Society and the Chemical Society for the production of Chemical Abstracts which is now under the Bureau of Chemical Abstracts composed of representatives of both societies.

The duty placed upon societies of conveying scientific information to their members entailed a very considerable expense, and he thought that still further avenues might be explored which would lead to a closer co-operation between the various societies and a diminution in the expenditure of each of them.

The President then discussed the necessity of informing the general public of the work on which chemists were engaged, and the impossibility of building up a reputation without publicity. As an example of such work he instanced the British Empire Exhibition at Wembley, where the Chemical Hall occupied the largest position in the Palace of Industry. He also referred to the publication of *Chemistry in the Twentieth Century* and its effect on scientists in other countries, and to the pamphlets which had been prepared for the public giving some information as to various branches of Chemical Industry. In conclusion he emphasised the point that Chemical Industry and Chemical Science were so brought together that it was impossible for the industry to succeed without the chemists, and there would be no chemists unless the industry was there to find employment for them.

Unemployment Among Chemists

Mr. A. T. Smith said the publicity which they had been able to effect during the last twelve months had done a great deal of good. Attention had been called to the work of chemists with the result that the public were better able to judge of the value of their work. The serious problem they had to face was what were they going to do with the chemists who were being trained? Whatever business or profession men went into they could not have too much intelligence of a certain sort. He was the last man in the world to throw cold water on educationists, but he wanted to warn them that it was a serious matter for a large number of young chemists to be turned out who would have to fall to the ground owing to the slackness of the industry. He believed it was only a passing phase, and in any event the training would result in a better type of men of every sort.

Professor C. O. Bannister thought the number of chemists being turned out had been somewhat exaggerated. He had had an opportunity of seeing the report from the Appointments Bureau of the Liverpool University, in which it was stated that there were 32 chemists seeking appointments and 15 engineers, and this was not a large number for the University to have on the unemployment list. Of the 15 engineers one at least graduated in 1911 and was still on the unemployment list, but had held several engagements in the meanwhile and was merely anxious to get a better job. Even if there was no room in the laboratories of chemical works the University training would enable these young men to fill better positions than they otherwise would.

Mr. J. E. Southcombe said unemployment among chemists was due to the depression in the activities of chemical industries, and that was the very reason why he supported publicity. In this country they were a nation of engineers, shipbuilders and carriers, and every man was a natural engineer. Chemistry was the real ground of science on which everything in the future depended. He hoped in the future they would be a nation of manufacturers, and they could not be that unless chemical knowledge was disseminated throughout the whole of their industries.

Mr. E. D. Kanin, speaking as a student, said there were many more men with honours degrees who were out of work and seeking work than had been stated by Professor Bannister.

Mr. W. H. Roberts said the number of chemists out of employment was largely due to the fact that after the war so many men took advantage of the University education offered them, but owing to the trade slump they had been unable to obtain positions. He thought, however, the matter would right itself in the same way as the medical profession, which was also overcrowded. Last year the number of entries of medical students at the Liverpool University dropped from over 2,000 to about 475, which was about the average number before the war.

Mr. J. Twomey said there were all sorts of factories with no chemists, and they did not know they needed them. That was the sort of publicity they should try for, so that instead of chemists looking for work they should have manufacturers looking for chemists.

Mr. W. M. W. Fell said it rested with the Society not so much to educate one another through the journal as to educate the "Upper Ten" of the general public. The publicity that the chemical industry wanted did not lie in publicity of the present-day stunt merchants, but in a general educative effort which would lead to the conclusion that the British Isles were capable of turning our chemists sufficiently educated and with sufficient brains and research knowledge to be in nowise inferior to those who were looked upon as the supreme chemists of the world, the Germans. Mr. Woolcock was to be congratulated on his handling of a very difficult subject, and upon his efforts to put the chemical industry upon the pedestal it deserved amongst the industries of this country.

Mr. Woolcock was cordially thanked for his address, and the members adjourned to the University Club where they partook of an oyster supper, the remainder of the evening being spent in social intercourse.

Advertising Chemicals

PERHAPS the outstanding feature of chemical advertising is that it is so seldom addressed to buyers of chemicals, says a contributor to *Drug and Chemical Markets*. The reason is not obvious, but tradition, conservatism, the fact that many chemicals are raw materials and remote from public interest, the semi-scientific nature of many products, the reticence of chemists and engineers, and the reluctance of chemical merchants and brokers to disclose uses of products, are all contributing factors. The chemical industry will never get the audience it should have until it advertises in chemical business papers with an eye to the needs of the buyer. Vagueness is fatal, and the industry should stop advertising that they either make or offer something "with no word of why or wherefore."

The Use of Arsenic Compounds as Insecticides

The use of compounds of arsenic as insecticides received a distinct impetus when the efficacy of calcium arsenate against the boll-weevil was established. The United States Department of Agriculture in a Bulletin (No. 1,147) entitled "Chemical, Physical and Insectical Properties of Arsenicals," has recorded work carried out by the Department on existing insecticides with a view to improving them or discovering new ones. The abstract given below deals principally with the chemical aspects of this investigation.

Standardised Insecticides

PARIS green and lead arsenate, which have been standardised and found reliable for many years, were the principal insecticides for use against external chewing insects until the recent discovery of the value of calcium arsenate in combating the boll-weevil. The manufacture of calcium arsenate, although well beyond the experimental stage in most factories, has taken some time to become completely standardised. Because of the importance and recent large-scale production of calcium arsenate many of the results in the report deal with comparisons of calcium and lead arsenates.

Arsenious oxide (As_2O_3), commonly called white arsenic, is the basis for the manufacture of all arsenites and arsenates. The literature of the subject contains conflicting statements as to the solubility of arsenious oxide in water, probably owing to the very slow rate with which it goes into solution, and to the fact that there are three forms (two crystalline and one amorphous) of the compound, which are usually mixed in a commercial sample. The investigators found variations from 18 to 38 per cent. solubility in the samples tested. With the exception of Paris green the arsenites are prepared by combining arsenious oxide with a base, such as oxide of lead, zinc, calcium or magnesium. Arsenates are usually made by oxidation of arsenites during the process of manufacture. Arsenates of lead and calcium are in use as insecticides.

Lead Arsenates

In most cases the chemical composition of commercial samples of acid lead arsenates examined closely approached the theoretical composition. The manufacture of lead arsenate has become standardised to such an extent that different batches or "runs" of the product varied but little from the theoretical figures. The commercial lead arsenates were all found to be good and stable products, and the water soluble portion averaged less than 0·3 per cent. in good samples. Basic lead arsenate is also used to some extent, and is prepared by the action of arsenic acid on basic lead acetate. Only two samples were examined and these showed greater variations from the theoretical than did the acid arsenates, although both were relatively pure compounds.

Calcium Arsenate

Many of the early samples of calcium arsenate contained excessive amounts of water-soluble arsenic, resulting in the scorching of foliage when it was used and retarding any general adoption. Since 1907, however, many experiments have been carried out to devise a method for making a commercial calcium arsenate. It is now being produced by many American manufacturers and its sale is increasing. The quality of the commercial product has been much improved in recent years, but its course of manufacture has not yet been standardised as has that of lead arsenate. All the commercial calcium arsenates are made more basic than tricalcium a senate; that is, the molecular ratio of calcium oxide to arsenic oxide is 4 to 1 rather than 3 to 1. The additional lime is used in their manufacture in order to produce compounds relatively free from water-soluble arsenic. A somewhat large amount of carbon dioxide is found in the analysis of all commercial calcium arsenates, this being due to the fact that the lime used is always carbonated to a certain extent.

"Paris Green"

Paris green, which was originally used as a paint pigment, is said first to have been used as an insecticide in the western States. It is a compound of arsenic, acetic acid and copper. known as aceto-arsenite of copper. Paris green, even of a high grade, breaks down to some extent when water is added, but when it has been improperly prepared much more soluble arsenic is yielded on treatment with water. It has been found that high-grade Paris green is slowly attacked by water, and that the rate of decomposition is increased by grinding to a very fine powder and suspending in water. The presence of carbon dioxide in the water also increases the rate of decomposition. There are two sources of the soluble arsenic in Paris green, (*a*) the soluble arsenic originally present in the sample, and (*b*) the arsenic made soluble by water and carbon dioxide after the material has been applied. The admixture of lime with Paris green when used as a spray lessens its scorching properities.

Investigation of Mixed Insecticides

Complications frequently occur in the use of arsenic compounds for insectical purposes, because in order to reduce the cost of spraying the arsenical liquid is often mixed with other insecticides and sometimes with fungicides, gums, etc., to assist in the adherence of the insecticide to the foliage. Very little exact knowledge as to the chemical changes which take place in these combinations was available. Accordingly, an investigation was undertaken to obtain information on the changes which occur in some of the important combinations involving arsenicals. One pound of powdered acid lead arsenate per 50 gallons of water is recommended as satisfactory for most commercial spraying. Acid lead arsenate at this rate and other arsenic compounds in corresponding amounts, depending on their arsenious or arsenic oxid contents, were used in the tests. With a favourite lime-sulphur solution, lead arsenate was found to set up reactions producing soluble arsenic oxide and other compounds rendering the mixture undesirable for use on vegetation. With calcium acetate the lime-sulphur mixture did not produce any soluble arsenic when high-grade products were used. This arsenate therefore when mixed would seem to be a satisfactory insecticide, but experience in the field has shown that it often injures the foliage on which it is sprayed.

Experiments carried out on the mixing of arsenates with Bordeaux mixture (copper sulphate and lime) showed that no harmful reactions occurred with lead arsenates, calcium arsenates, or Paris green, in fact, owing to the lime in the Bordeaux mixture it was possible to mix arsenates containing a high percentage of soluble arsenic, or even sodium arsenate solutions, and the resulting mixture would be found free from soluble arsenic with a consequent freedom from burning properties.

Another favourite spray, consisting of a paraffin oil (kerosene) emulsion, was also examined in its effect on arsenates. It was evident, however, as a result of these investigations that the lead and lime of the arsenates combined with the fatty acids to produce soaps, leaving corresponding amounts of arsenic in solution. Though this was found to occur less with calcium arsenate, either mixture was chemically incompatible. With fish-oil soap similar reactions occurred to a greater extent, the whole of the arsenic becoming soluble after 24 hours if soap at the rate of 2 pounds per 50 gallons were used, the calcium arsenate being used at the rate of 0·93 pounds per 50 gallons, and the lead at the rate of 1·11 pounds per 50 gallons (equal weights of arsenic per 50 gallons).

Determination of Insecticidal Value

A long series of experiments was made to determine the relative toxicity of arsenic compounds and mixtures by feeding insects on sprayed leaves. Though the results were often complicated by various other factors influencing the life-period of the insects, by taking a large number of cases, and carrying out control experiments with untreated food and without food, it was established definitely that the chemical analysis of a given compound does not show whether it is suitable for general insecticidal purposes, but both a chemical analysis and a thorough toxicity examination are required.

Protection in Chemical Industry

Mr. Woolcock's Address to the London Section

In an address to the opening meeting of the London Section of the Society of Chemical Industry on Monday, November 3, Mr. W. J. U. Woolcock, the President of the Society—who, by the way, is visiting in a similar manner each of the sections of the Society throughout the country—discussed "Experiments in Protection." Naturally he dealt with the subject from the point of view of maintaining the chemical industry in this country, but he only discussed the relative merits of the various systems of protection which can be applied to an industry. He classified these into three, all of which have been tried here with varying degrees of success, namely, (*a*) subsidies, (*b*) prohibition of imports with licences, and (*c*) tariffs.

Subsidies were dismissed briefly with the statement that, whilst they are necessary and successful in war time they have become discredited in peace time on account of the general belief of the public that they imply an inefficient industry, although Mr. Woolcock added that this is not necessarily so, one reason given being that a similar industry abroad might be subsidised by its own Government and so compete unfairly with the unsubsidised industry in this country.

Dyestuffs and Safeguarding Acts

As regards the second two methods, prohibition of imports and issue of licences were exemplified in the Dyestuffs Act but could only be applied in regard to industries which had an organised body of users, as was the case with the Colour Users' Association. Mr. Woolcock pointed out how the Licensing Committee under the Dyestuffs Act had dealt with 20,000 applications since the Act came into force and that the constitution of the Committee, namely, five representing the colour users, three representing the trade, and three "other persons," had been entirely successful in its working. The point was made that where a foreign fine chemical or colour, for instance, had no competition from a home-made article, the price of the foreign article was always higher than when there was competition at home from a home-produced article, and that in the case of an organised body of consumers, such as the colour users, the consumer was always willing to pay a higher price for the home article, although it was difficult to estimate the exact extent to which he would go; nevertheless, it had some relation to the difference between the price of the foreign article without competition here and the price with competition.

The Safeguarding of Industries Act, which imposed a direct tariff, was referred to as a type of protection which could only be applied in cases where there were a large number of industries concerned and no organised body of users; at the same time the view was expressed that Part 2 of the Safeguarding of Industries Act had been a complete failure, and the hope was expressed that the experience of this would teach us a lesson for the future. On the other hand, Part 1 of the Act was generally believed to have been beneficial to the fine chemical industry of this country, although Mr. Woolcock doubted the wisdom of legislating by reference as in this case, when the Board of Trade was left to compile the list of articles to come within the Act after the Act had passed through Parliament. On the other hand, the many Parliamentary difficulties involved in passing an Act of Parliament containing a large schedule of articles to be protected were indicated.

Another feature of the address was a plea made by the President for a closer working in chemical industry on the part of the scientists and industrialists, and it was with this object in view that he excused himself for having departed so much from the general custom and discussed a subject of commercial rather than scientific interest. It must be borne in mind, however, that the Society was bound to deal both with the scientific and the industrial side of chemical industry.

Helium For Airships

The output of helium in the United States is apparently being severely taxed by the arrival of the ZR.3. The authorities are against the use of hydrogen, but until helium production can be speeded up there is not sufficient available for the existing airships. This would seem to be a serious drawback to any extensive development of the lighter-than-air craft.

Chemical Properties of Textile Fibre

Discussion at Nottingham Section

The Nottingham Section of the Society of Chemical Industry held a joint meeting with the Faraday Society on Thursday, October 30, when papers dealing with the physical and physico-chemical properties of textile fibres were read. The chairmen were Sir Robert Robinson and Mr. G. J. Ward.

Dr. W. Lawrence Balls, F.R.S., sketched the general conditions of the textile problem. The unit from the textile point of view, he said, was the single hair or fibre, a unit which to all intents and purposes had only two dimensions, being entirely flexible in the third. With this material three-dimensional persons, furniture, etc., must be covered. A scale model of a cotton fibre made of rubber tubing, $\frac{1}{2}$ inch in diameter, would be 60 feet long. All the surface properties of such fibres became enormously important. The slivers moved over one another along those surfaces in the process of drafting which, although invented in 1745, was one of which least was known. By trial it had been found that the rollers should be covered with leather, should have true surfaces, and machinery had been perfected so far that defects in yarn and fibres formerly due to faults in the machinery must now be considered to be inherent in the properties of the raw material. The exaggeration of these properties in one direction, which was peculiar to the material of the textile industries, opened a new field of applied physics, for which the author proposed the term "Trichodynamics" in 1918.

Lustre Produced by Mercerisation

Dr. J. Barratt, of the Research Department, Woolwich, gave a résumé of his work on the lustre produced in cotton by mercerisation, and also the measurement of the transparency of a fabric. Photographs of fabrics stretched and unstretched during mercerisation showed much smoother surface in the former, and the disappearance of the folds and creases would account for the superior brilliancy and increase in the intensity of light regularly reflected. In order to measure the intensity of light reflected at various angles, a special form of Joly's photometer had been designed. Most of the increased lustre shown in a mercerised fibre was due to the light regularly reflected in a direction along the length of the fibre. This regular reflection was intermediate in intensity between that from glass and that from the unmercerised thread. The diffuse reflection was greater in the case of the unmercerised fabrics, in which the lustre due to the single fibres was enhanced. A mercerised fabric also showed a distribution of very bright and very dull points. By the same photometer the relation between the total transparency and the thread transparency (*i.e.*, the percentage of the light falling on the threads alone which is transmitted by them) could be determined. Thus the thread transparency 24·8 of a muslin was increased to 30·8 by a "hard finish."

Action of Sunlight

Dr. Guy Barr described the various methods of investigating the action of sunlight, and of artificial lights such as the mercury arc approximating to sunlight, upon fabrics, especially those used in the construction of balloons. The distribution of destructive power in the spectrum had been investigated by Scheurer, Aston, Ramsbottom, and Glendinning, and it had been conclusively shown that the weakening of cellulose threads was chiefly due to rays of wave-length less than 4,000 A.U., and cellulose was extremely sensitive to the rays of very short wave-length less than 2,950 A.U. which were present in the light of the mercury arc, but absent from sunlight. The breaking strain reduced from 120 lbs./in. to 102 by light of 6,250 to 5,330 transmitted through red glass fell to 12 when it was transmitted through violet glass (6,300 to 3,230 A.U.) and to 2 with no glass. The fabric was partly protected by pigmented dopes, the most effective being lead chromate. These changes were due to oxidation for they were almost inhibited in absence of oxygen, and cotton which had been insolated gave the tests for oxycellulose.

Dr. S. A. Shorter gave a detailed account of his theories which dealt with the behaviour of woollen fabrics during manufacture under the heads (1) the elastic properties, (2) the absorption of moisture and its effect on the elastic properties, (3) the surface structure of the film.

Detecting Strains in Glassware

A Direct Optical Test

MANY readers are interested in the question of the breakage of glass bottles and of other kinds of glassware. It is still not generally known to the large number of users of glass bottles that the breakage of glassware is, in a very great number of cases, due to faulty annealing. The modern method of making bottles is to mould them very rapidly in automatic machines fed from huge tanks of molten glass. When the bottles, still hot, come from the machine, they are placed in a larg annealing furnace, or " lehr " as it is called, through which the bottles are slowly carried on a travelling floor. The entry end of the lehr is, or should be, at a temperature sufficiently high to keep the glass just soft enough for all strain to be released ; and the temperature of the lehr then falls gradually towards the exit end, at which the bottles are cold enough to handle.

There are two essentials in the annealing process. Firstly, the bottles should be raised to a sufficiently high temperature, and secondly, the temperature should be reduced with sufficient slowness. Passage through the lehr customarily takes a number of hours, sometimes seven or eight. Hence, when anything goes wrong in the annealing process (for instance, when the temperature near the entry is too low, or the cooling at the critical part of the passage through the lehr is too fast), it usually happens that a large number ot bottles will have been badly annealed before the fault become apparent. This is why purchasers ot bottles sometimes receive large consignments containing bottles liable to break on the slightest provocation, and the fact that such an occurrence is infrequent only serves to aggravate the inconvenience when it does arise.

In the case of makers of jams, etc., where the bottling is done hot, the fault usually becomes apparent at the time of filling. In the case of acids, chemicals, drugs, etc., where the bottling is done cold, the breakage usually occurs in transit or in the hands of the customer, and in the case of exported goods the trouble becomes almost impossible to trace back to the particular bottle maker whose goods were at fault.

The strain due to faulty annealing is quite invisible to the naked eye ; the glass article may look perfect and yet be badly annealed, and, therefore, strained and unduly liable to break. The firm of Adam Hilger, Ltd,, 75A, Camden Road, London, N.W.1, has, however, had on the market for a number of years a " Strain-Viewer," as it is called, designed for detecting at a glance the presence of strain. This instrument is in use by a large number of the most important manufacturers of bottles, chemical and other glassware, but its value has not hitherto been appreciated by purchasers and users of bottles, etc.

The apparatus is so arranged that any article can be held by the hand in a beam of polarised light at a convenient distance from the eye, when the presence of strain is revealed by distinct changes of hue on the portions of the object which are in tension or compression. The field of view, including all parts of the glass which are not strained, remains a magenta tint, and the condition of strain is readily judged from the hue of the strained parts.

Chemical Survey of Coal Resources

THE Fuel Research Board has just published the third of the series of reports of the Physical and Chemical Survey of the National Coal Resources. This deals with the Arley Seam in the Lancashire Coalfield (H.M. Stationery Office, price 2s. 6d. net). The Arley seam persists throughout a wide area in Lancashire and the coal is of a bituminous strongly caking type widely employed for gas making. It is also used in Lancashire for steam raising, manufacturing and household purposes. It yields also a metallurgical coke with a small ash and sulphur content. The report contains analyses of various samples from different localities, and the results of low temperature carbonisation, steaming in vertical retorts, and heating in oxygen. A series of illustrations is also included showing the appearance of cokes obtained under different conditions from coal from different places. The report thus forms a valuable record of the characteristics of Arley coal, which is one of the most valuable beds in the Lancashire coal-field and which probably persist through the buried field which has been proved to exist southwards of the area at present worked. It is of interest to note that the work of collecting the information for drawing up the report has been carried out by a local executive committee appointed by the Lancashire and Cheshire Coal Research Association and containing representatives of the Fuel Research Board and the Geological Survey. The work of the survey is a very large one, but it is felt that it has been soundly conceived, and a second committee for the South Yorkshire area has now been appointed, while it is hoped that other committees will shortly be started in different areas. In the work of this survey is to be found an example of necessary and valuable work being efficiently undertaken by the Government, which is thus fulfilling a function no other body organised on commercial lines could be expected to undertake.

Photosynthetic Sugars

British Association Discussion at Saskatoon.

ONE of the features of the British Association's visit to Canada was the opening of a new chemistry building at University of Saskatchewan, at Saskatoon. An account of this has just come to hand in *Industrial and Engineering Chemistry*, the official ublication of the American Chemical Society.

After presentation of the building to the university by the Premier of Saskatchewan and acceptance by the chancellor of the university, the building was inspected and the scientific meetings were held.

Professor E. C. C. Baly, of Liverpool, then described his notable work on photosynthesis. His observations of the changes which take place in the quartz test tubes exposed to ultra-violet light, and in the lamps themselves when operated at low voltage or kept at low temperatures, are especially important as possibly explaining the failure of other workers to check his results.

Principal J. C. Irvine, of St. Andrews, then gave the results of his examination of Baly's photosynthetic sugars. Professor C. W. Porter, of the University of California, followed with a clear presentation of his researches in which he has so far been unable to check the results observed by Professor Baly. He found formaldehyde only in cases where the carbon dioxide and water had come into contact with such organic substances as are usually found in apparatus such as rubber tubing, stopcock grease, wax, and the like. He failed to obtain any trace of formaldehyde in all-glass apparatus and when working with especially purified carbon dioxide and conductivity water. As brought out in discussion, plants do not use conductivity water, and it is possible that catalytic action depends upon some unidentified impurity. Professor J. H. Priestley ot the University of Leeds, then discussed " the first sugar formed on the polymerisation of formaldehyde," pointing out first of all that the chemical researches under discussion could have nothing to do with what actually takes place in the plant. No plant could tolerate amounts of formaldehyde which could be detected, and, besides, the reactions in plants from carbon dioxide and water to the ultimate storage products such as starch, sugar, and cellulose go on at high speed. Therefore, intermediate products are not accumulated.

The chemical building is an attractive and impressive building with a massive tower in the Gothic style and well designed for the needs of the university. There are no metal drains, down-spouts, or sinks, ceramic ware being used throughout. Enamelled bricks are used in a unique system of flues to carry vapours away from water baths, and the laboratory desks are equipped with fume ducts.

Canadian Sulphide Ores

CANADA is noted for the abundance and variety of its sulphide ores. A special process is designed to treat any ores containing a preponderating amount of iron and sulphur in such a way as to recover all ingredients.

Thus the Sudbury ores would yield sulphur and electrolytic iron in addition to the copper, nickel, and precious metals now recovered, states the Agent-General in London for the Province of Quebec, according to the *Board of Trade Journal*. In the case of the newly discovered sulphide ores in Rouyn township, Quebec, sulphur, iron, copper, gold, and silver would be recovered. There are numerous deposits of admixed copper and iron sulphides in the Eastern townships of Quebec whose economical use has long remained a problem. This special process would resolve this ore into sulphur, iron, and copper—the whole of the ore being thus turned into saleable products. Recently it has been found that the process is applicable also to the recovery of lead and zinc.

Ramsay Memorial Fellowships

THE appointments to Ramsay Fellowships in Chemical Science for this session (British, Dominion and Foreign) are practically completed. At the present time sixteen Fellowships are being held in the Universities and Colleges of the United Kingdom. The list of awards for the present session is as follows. In each case the University or College which has been selected by the Fellow for his research is given :—

British Fellowships : Mr. Samuel Coffey, Ph.D., University College, London ; Mr. A. F. Titley, B.Sc., Phil.D., University of Oxford ; Mr. Sidney W. Saunders, B.Sc., University College, London.

Glasgow Fellowships : Mr. T. S. Stevens, B.Sc., University of Oxford ; Mr. Alex. Robertson, Ph.D. (since resigned on appointment to an International Fellowship in New York).

Canadian Fellowship : Mr. Edward H. Boomer, Ph.D., University of Cambridge.

Danish Fellowship : Mr. Kai J. Pedersen, University of Bristol.

Dutch Fellowship : Dr. J. Kalff, University of Manchester.

French Fellowship : Dr. H. Weiss, Royal Institution, London.

Greek Fellowship : Dr. Nicholas Oeconomopoulos, University College, London.

Italian Fellowship : Dr. Antonio Nasini, University of Cambridge.

Japanese Fellowship : Dr. Kameyama, University College, London.

Norwegian Fellowship : Mr. Leif Lindemann (provisional).

Spanish Fellowship : Dr. Miguel Crespi, University College, London.

Swedish Fellowship (temporarily vacant).

Swiss Fellowship : Dr. Walter Feitknecht, Royal School of Mines, London.

The total value of the annual amount of the Fellowships that is awarded is approximately £4,800, of which approximately £3,300 is provided by grants from Dominion and foreign sources.

Wembley—Past and Future

A VISIT to the British Empire Exhibition last week showed that attendances had markedly fallen off from the level maintained until recently. An almost deserted appearance was presented in places, but everything was well-cared for, clean and well swept. In the grounds, although the leaves had disappeared from the trees, the lawns and flower beds looked brighter than they did in the summer. It is interesting to note, however, that though the number of visitors fell off by 50 per cent. during the past few weeks, the takings of stallholders, such as in the Chemical Section, where goods were sold to the public, fell off by some 10 per cent. only.

It was expected at the closing ceremony on Saturday in the Stadium that some indication would be given by the Prince of Wales of what will be done next year. This unfortunately was not the case. Many exhibitors have, however, been so pleased with the results of the exhibition, and the public undoubtedly desires that good use should be made of the buildings and grounds, that it seems very probable that there will be an exhibition next year. If that is so, the Chemical Industry seems in the main to realise that it cannot afford to be unrepresented, although probably its display would not be on so lavish a scale as this year.

Dyestuffs Licences Issued in October

THE following statement relating to applications for licences under the Dyestuffs (Import Regulation) Act, 1920, made during October has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee :—

The total number of applications received during the month was 543, of which 452 were from merchants or importers. To these should be added 25 cases outstanding on October 1, making a total for the month of 568. These were dealt with as follows :—Granted, 424 (of which 378 were dealt with within seven days of receipt) ; Referred to British makers of similar products, 96 (of which 73 were dealt with within seven days of receipt) ; Referred to Reparation Supplies available, 36 (all dealt with within two days of receipt) ; outstanding on October 31, 1924, 12. Of the total of 568 applications received, 487 or 86 per cent. were dealt with within seven days of receipt.

Oilfields in Argentina

Paper Before the Institution of Petroleum Technologists

THE story of the lucky discovery of a valuable oil deposit in Argentina was told at a meeting of the Institution of Petroleum Technologists in London, on Tuesday, by Mr. Campbell Hunter. Many attempts had been made from 1890 onwards to win oil which was discovered from time to time, but none of the companies was successful. In 1907 owing to the absence of fresh water at the small fishing port of Comodoro Rivadavia, the Government undertook to drill a well. Although it soon became evident no fresh water was likely to be encountered—in fact the well stood full of salt water—drilling operations were continued, with a view to affording useful geological information as to the sub-strata in that portion of Patagonia. On attaining a depth of 500 metres, the engineer in charge asked for further instructions, but before these were received to the effect that operations were to be suspended and the rig dismantled, oil was struck at 535 metres, the well flowing strongly. With this happy outcome the modern history of the oil industry may be said to commence.

Encouraged by the success obtained at Comodoro Rivadavia, the Argentine Government started prospecting operations at Plaza Huincul, in the territory of Neuquen, about 1917. The first well was completed in September, 1918, at 610 metres, at which depth it flowed strongly. Throughout the Argentine territory there are indications of oil asphalt, rafaelite, etc., but so far no systematic prospecting operations have been carried out.

Output from Comodoro Rivadavia

So far as the output of oil from the Comodoro Rivadavia field is concerned this now amounts to about 750,000 tons per year. The area is worked by the Government and three oil companies. The oil is essentially of the fuel oil type, an average analysis being as follows :—

Specific gravity at 15° C.	0·912
Viscosity at 15° C.	21·15
Flash point	22° C.
Calorific value	10,000 to 10,200 calories
Distillation—commences at	75° C.
Products distilling over up to 150° C.	4·5%
Products distilling over from 150° C.–300° C.	18·5%
Products distilling over above 300° C.	77·0%

The bulk of the production is shipped in its crude state to Buenos Aires and Bahia Blanca, where it is used as fuel, though a small quantity, amounting in 1923 to 43,062 tons, was passed through the Government refinery at Comodoro Rivadavia.

The Neuquen Field

In the Neuquen area the first commercial oil well was struck by the Government in 1918, and oil flowed at the rate of several tons a day. The following is an analysis :—

Specific gravity at 22·5	0·8423
Calorific value	11,000 calories
Sulphur	0·11%
Paraffin	2·9%
Asphalt	0·11%
Viscosity at 20°	3°·2 Engler
Flash point	−3° C.
Ash	0·0101%
Water	Nil.
Products distilling over up to 150°, *i.e.*, petrol	24·4%
Products distilling over from 150° to 300° Centigrade, *i.e.*, kerosene	38·5%

Though a number of wells were sunk in the area they were not exploited after flow ceased, pumping having been introduced quite recently.

Mr. Hunter also described the various asphalt and other indications in Argentina, and discussed their geological relationships. He also referred to a well drilled in the Sub-Andean region by the State Railways Department, where the conditions are considered indicative of a satisfactory field.

From Week to Week

REPORTS STATE THAT British capitalists are to establish an Italian artificial silk industry on a large scale.

SIR JOHN BRUNNER, who was defeated at Southport, has presented the town with an oil painting, "Morning Mists," Kilchurn, N.B., by Alfred de Bréanski, R.B.A.

THE DEATH IS ANNOUNCED of Mr. William Napier-Corbyn, for many years London manager and director of Johnson Brothers, Ltd., paint manufacturers, of Cleveland Works, Wincolmlee, Hull.

MR. T. R. B. SANDERS, who for the past two years has been engaged in research work under the Department of Scientific and Industrial Research, has been elected a Fellow of Corpus Christi College, Cambridge.

THE EXPORTS of iron ore from Sweden have approached pre-war levels during the past few months. The average index figure for the period June-September was 91·75 compared with 100 for 1913 and 77 for 1923.

MR. JOSEPH TAYLOR, head of the saturators and chemical plant firm, of Bolton, was again returned as a member of the Bolton Town Council at the recent municipal election. From 1910 up to the present time Mr. Taylor has been regularly returned without opposition.

MOTOR SPIRIT CONTAINING TETRA-ETHYL is not to be sold in New York City, by order of the Board of Health. This motor spirit is believed to have caused the deaths recently of several employees in the research laboratory of the Standard Oil Co. of New Jersey (as reported in THE CHEMICAL AGE, November 1).

THE SMOKE ABATEMENT EXHIBITION AND CONFERENCE opened at Manchester on Tuesday last. Sir Frank Baines, director of H.M. Office of Works, mentioned that out of an annual expenditure of £1,570,000 on Government buildings, probably from 30 to 40 per cent. would be saved if the atmosphere was pure and acid free. Portland stone in some cases had been eaten away and rendered quite soft to a depth of three inches. Appeals were made for the installation of more electric furnaces, more public inquiry and research, and the suppression of the domestic grate.

A GENERAL MEETING of the members of the Royal Institution was held on Monday, Sir James Crichton-Browne, treasurer and vice-president, in the chair. The special thanks of the members were returned to Sir Alfred Yarrow for his generous donation towards the cost of advertising the lectures, and to Mr. Archibald D. Fox for his gift of Michael Faraday's penknife. The chairman announced that the Christmas Lectures this year would be delivered by Frank Balfour Browne, Lecturer in Zoology (Entomology) in the University of Cambridge, the subject being "Concerning the Habits of Insects." Mr. A. O. Trencham was elected a member.

IN THE CITY OF LONDON COURT on October 31, the Compagnie Commerciale du Nord, Great Britain, Ltd., of 54, Gracechurch Street, London, chemical merchants and agents, claimed an amount of commission due from Mr. W. Thomas, of 67, St. Mary Axe, London, on a transaction in crude methyl alcohol said to be due to their introduction. The plaintiffs stated that a commission of ½d. per gallon was agreed, but defendant declared that this was altered to a brokerage of 1 per cent. as he was misled concerning the influence of the introduction. The plaintiffs were able to prove that business had resulted from their action and gained judgment for the amount claimed, with costs.

AT THE ANNUAL GENERAL MEETING of the Glasgow and West of Scotland section of the Institute of Chemistry on October 31 Dr. H. Hepworth, Mr. I. V. Hopper, and Dr. N. Picton were elected to the committee, and Dr. W. M. Cumming was re-elected honorary secretary. The following associates were duly admitted by Professor G. G. Henderson, F.R.S., president of the Institute:—Messrs. G. H. Train, B.Sc.; F. R. Storrie, B.Sc.; G. Davidson, B.Sc.; H. H. Bell, B.Sc.; Q. Moore, B.Sc.; M. Herd, B.Sc.; M. M. Nicholson, B.Sc.; J. Lynch, B.Sc.; W. H. Chalmers, B.Sc.; A. R. Jamieson, B.Sc.; and D. Hall, B.Sc. The president, in his address later, stressed the necessity for the consolidation of all chemical interests, particularly by the unification of chemical publications, culminating in the issue of a single journal for the English-speaking peoples.

A LOAN OF £10,000 for development of a factory for extracting starch, glucose, and dextrine from potatoes is being asked from the Government of Victoria by a local enterprise.

MR. STANLEY GROSSMITH, whose death took place at Esher on Saturday at the age of 45 years, was chairman of J. Grossmith and Son Ltd., manufacturing perfumers, of Newgate Street, London.

THE SULPHIDE CORPORATION, LTD., of New South Wales will commence the manufacture of cement on a large scale early next yea The plant, which is costing over £200,000, will have an a al output of 30,000 tons.

HARDING, H LAND AND FRY, LTD., of 27, Garlick Hill, London, E.C.4 uform us that on and after November 11 their address l be 52, Queen Victoria Street, London, E.C.4, and the phone number will be City 590.

MR. W. J. U. OLCOCK will occupy the chair at the meeting of the Chemical ngineering Group of the Society of Chemical Industry, to b ld at the Kelvin Room, Engineers' Club, Coventry Stree ondon, on Thursday, November 13.

THE INSTITU N OF ELECTRICAL ENGINEERS has made a donation of 100 uineas to the Cavendish Experimental Laboratory at Cambr ge, as a mark of appreciation of the electrical researches carr out there by Sir Joseph Thomson, Sir Ernest Rutherf and other Cambridge physicists.

OF THE 888 IBITORS at the Danzig fair, only two were from Great Bri Exhibitors from the chemical and allied industries num d 63, and from the metallurgical and engineering indi es, 75. Great Britain is to give a collective national displa the Spring fair to be held from February 5 to 8, 1925.

A NOTICE HAS EN ISSUED by the Home Office, applying the provisions of ub-section 4 of section 73 of the Factory and Workshop , 1901, to all cases of: poisoning by carbon bisulphid poisoning by anilin and its compounds; and chronic benz poisoning occurring in a factory or workshop. The order to come into force on January 1, 1925.

THE SESSION OF 1924-25 has opened in the Honours School of Chemistry at the University of Birmingham, with an attendance of thirty-two s dents. In the Research School of Chemistry there are now t nty-eight post-graduate research workers, an unprecedented nu ber in this department of the University. A Salter Research ellowship tenable at the University has been awarded to V. Yarsley, B.Sc., by the Salters' Institute of Industrial Chemis y; a Lord Kitchener Memorial Scholarship has been exten d to A. E. Rawson, B.Sc., for research in chemistry and ch ical bacteriology, and a Priestley Scholarship for chemical r earch has been granted A. F. Chrisman, B.Sc.

HEYL'S COLOURS, LTD., OF ROTTERDAM, have purchased property in Luton for the purpose of manufacturing their products. They w l manufacture the highest grades of chemical and miner l colours, and other chemical products. These operations will be carried on under agreement with Heyl's Verfwaren-Maatschappij (Heyl's Colour Co.), Rotterdam, who are the holders of various secret processes to be employed. With manufacture in Luton is accompanied the rights of sale in the United Kingdom and the Colonies. Arrangements have also been made for the sole representation of the firm of Scholten-Sichel Amalgamated, Ltd., of Groningen, Holland, manufacturers of vegetable gums, glues and pastes. This new undertaking at Luton will be a further development of the international firm of Gebruder Heyl, which was established at Charlottenburg in 1833.

AT BOW COUNTY COURT, on November 3, before Judge Snagge, Perry and Hope, Ltd., of 1, Leadenhall Street, London, chemical manufacturers' merchants, sued H. Ginsborg and Co., of Bow Bridge, wharfingers, to recover £43 15s. damages sustained by the plaintiffs through defendants' default in not delivering 15 carboys of acetic acid. Mr. Wyles, for the plaintiffs, explained that they took charge of a consignment of acetic acid which arrived on December 24, 1923. There was one lot of 50 and other of 83 carboys, of which they had taken delivery by means of orders given to their customers, on the defendants, of 48 and 61 carboys respectively. They were prepared to allow for 9 carboys which were broken, which left 15 unaccounted for, and for which they asked the value, £43 15s. The action was undefended, and plaintiffs were awarded judgment, with costs.

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Abstracts of Complete Specifications

222,530. Concentrating Oxidised Ores by Flotation, Process of. E. C. R. Marks, London. From Eureka Metallurgical Co., 727, McIntyre Building, 68, South Main Street, Salt Lake City, Utah, U.S.A. Application date, May 1, 1923.

Specification No. 194,260 (see The Chemical Age, Vol. VIII, p. 520) describes a process in which the ore is ground in a tube mill with a solid hydrocarbon such as paraffin wax, and sodium sulphide, to produce a pulp for flotation. In the present invention a thick pulp of oxidised ore is treated with liquid hydrocarbon and a soluble metallic sulphide to convert the ore superficially into sulphide. These substances are then removed from the ore, which is diluted to form a thin pulp, and then subjected to flotation. The crude ore is preferably separated initially into sands and slimes, which are then treated separately. The liquid hydrocarbon may be petroleum sludge, and the pulp, which then contains oil and sulphide, is dewatered to remove as much as possible of these substances. The pulp is then mixed with several times its volume of fresh water so that the sulphide is largely diluted, and then subjected to flotation. An example is given of the treatment of an oxidised silver-lead ore by this process, which showed a recovery of 81·5 per cent. of the silver and 92 per cent. of the lead.

222,549. Treating Vegetable Matter by Fermentation to Obtain Alcohol, Acetone and Other Products, Process for. H. R. Norbury, A. P. H. Desborough, A. C. Thaysen, and L. D. Galloway, Royal Naval Cordite Factory, Holton Heath, Dorset. Application date, June 27, 1923.

The object is to obtain alcohol and acetone by fermentation from vegetable matter such as straw or grass. The raw material is treated under pressure with hot dilute mineral acids to convert insoluble pentosans into soluble pentoses. The hydrolysed mash, which may contain vegetable residues, is cooled to 40°–43° C. by exchange of heat with the water for treating fresh quantities of material and then neutralised with lime, so that the hydrogen ion concentration (pH) is on the alkaline side of the neutral point. The mash is then inoculated with a culture of a bacillus acetoethylicus so that the pentoses are converted into ethyl alcohol, acetone, and organic acids, hydrogen and carbon dioxide being given off.

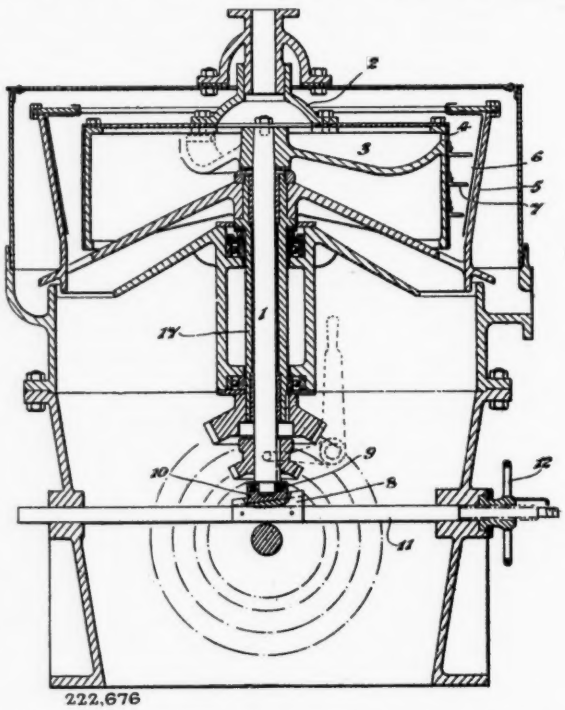
It is necessary during fermentation to keep the pH of the mash constant by adding lime in small quantities. The fermentation is complete in 1½ to 5 days, and a yield of 33–40 per cent. of ethyl alcohol and acetone is obtained. These volatile products are distilled off, and calcium salts of organic acids remain. At the same time carbon dioxide and hydrogen are evolved, the latter amounting to 1,000 to 1,200 cubic feet per ton of vegetable matter. The vegetable residues are removed, and may be employed to generate producer gas. The best results are obtained when the hydrolysis is conducted at low temperatures and concentrations, *i.e.*, below 10 lbs. per square inch when using 1 per cent. acid. The pressure should increase with the dilution of the acid.

222,587. Recovering Ammonia from Gases or Vapours, Process of. W. A. Bone, Montrose, Harpenden Road, St. Albans, and G. I. Finch, 10, Gainsborough Mansions, London, W.14. Application date, July 7, 1923.

Ammonia is recovered from gases by absorption in phosphoric acid. It has been found that the rapidity of the absorption is approximately equal to that of sulphuric acid of equivalent strength. The absorption by a 1 per cent. solution below 50° C. is quantitative while the escaping gases at normal pressure contain ammonia at a partial pressure of 0·2 mm. at 60° C., rising to 1·2 mm. at 80° C. The principal product is diammonium hydrogen phosphate, which yields ammonia when heated to 170° C., leaving monoammonium dihydrogen phosphate, and/or phosphoric acid. This process enables ammonia to be recovered from coal gas, coke-oven gas, or producer gas, without the use of sulphuric acid, since the residue after recovering ammonia by heating may be used again for absorbing ammonia. The ammoniacal gas should be first freed from tar, and cooled to 50° C. before treatment. Diammonium hydrogen phosphate is formed, and an equivalent amount of phosphoric acid or monoammonium dihydrogen phosphate is added to the solution. The saturators need not be lead-lined. The diammonium salt crystallises, and may be centrifuged. In the direct recovery of ammonia from coke-oven gas which is not usual cooled below its dew point before removal of tar and ammonia, the temperature may be above 70° C. In this case, the small proportion of ammonia which escapes may be recovered with sulphuric acid. The diammonium hydrogen phosphate may be heated dry to 170° C., or treated with superheated steam so that the ammonia is driven off and recovered as a concentrated solution in the condensed steam.

222,676. Centrifugal Filters, Separators, Etc. Lilleshall Co., Ltd., and C. A. Bishop, Oakengates, Shropshire. Application date, October 9, 1923.

The vertical shaft 1 carries a member 2 into which the material to be treated is introduced. The material travels



222,676

radially through conduits 3 to apertures 4, so that it is thrown outwards by centrifugal force against the filter cloth 6, mounted on a conical member 5. Longitudinal grooves are provided on the inner sides of the latter to conduct the liquid away, and the solid material deposited on the filter cloth is removed by helical scrapers 7. The vertical shaft 1 is supported in a bearing 9 in a block 10 which rests on a wedge 8. The latter is moved horizontally by a wheel 12 so that the scraper 7 may be lowered during rotation into close proximity with the filter cloth 6, to remove the deposits. The shaft 11 may be alternatively moved automatically so as to operate the scraper after a predetermined number of revolutions. The member 5 is mounted on a sleeve 17, which is adapted to be separately driven at a different speed. If the speed of the two rotors is slightly different in the same direction, the solid deposits are conveyed downwards, or the speed of the two rotors may be the same to prolong the filtering period.

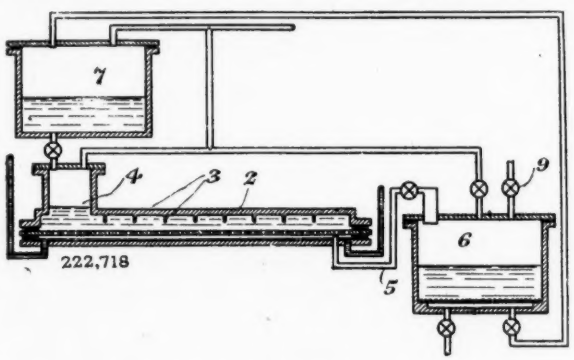
222,624. Sulphurised Dyestuffs and Intermediate Products, Manufacture of. Soc. of Chemical Industry in Basle, Switzerland. E. Reber, 48, Spalenring, Basle, Switzerland, and J. Froehlich, 9, St. Johannvorstadt, Basle, Switzerland. Application date, August 17, 1923. Addition to 201,540.

Specification No. 201,540 (see The Chemical Age, Vol. IX p. 350) describes a process in which indophenols from a mono-

alkyl-α-naphthylamine and a para-aminophenol are converted into sulphonic acids of 1-monoalkyl-amino-4-para-oxyaryl-naphthylamines, and these sulphonic acids are heated with alkali polysulphide in the presence of copper to obtain green sulphurised dyestuffs. In this invention, an indophenol from an aralkyl-α-naphthylamine or from a dialkyl-α-naphthylamine is treated with a salt of sulphurous acid to obtain arylkyl-amino- and dialkylamino-4-para[1]-oxyaryl-naphthylamine sulphonic acids respectively. These products may be sulphurised by heating with alkali polysulphide in the presence of copper to obtain fast green sulphurised dyestuffs. In an example, the indophenol obtained by the action of quinone chlorimide on benzyl-α-naphthylamine is treated with sodium bisulphite solution, and then heated gradually to 40°-50° C. The mixture is made alkaline with sodium carbonate, and evaporated in vacuo. The sulphonic acid of 1-monobenzylamino-4-para[1]-oxyphenyl-naphthylamine is obtained. The sodium salt is boiled with sodium sulphide, sulphur, and copper sulphate. Air is blown through the liquid to separate the dyestuff. Another example is given in which the indophenol from dimethyl-α-naphthylamine and para amino phenol is used.

222,718. Alkali Metal Amides, Manufacture of. T. Ewan, 86, Shuna Street, Maryhill, Glasgow. Application date, December 8, 1923.

Sodamide is produced in the presence of liquid anhydrous ammonia containing a dissolved salt such as a cyanide, and in



the presence of a catalyst. The latter may be high-carbon iron or steel. The amide may be made from the alkali metal added as such, or produced electrolytically from an amalgam anode. In an example, the electrolyte is a solution of 50 parts of sodium cyanide in 100 parts of anhydrous liquid ammonia. The cathode is constructed of high carbon steel, from which the containing vessel 2 may be constructed. Additional surfaces 3 may be arranged near the surface of the electrolyte 4, so that they are in contact with the sodium solution and the electrolyte. The electrolyte overflows by a pipe 5 into a filter 6. Sodium amide is rapidly formed and is nearly insoluble in sodium cyanide solution so that it remains in suspension, and is renewed by continuously supplying fresh sodium cyanide solution from the reservoir 7. The sodamide in the vessel 6 is washed by liquid ammonia admitted through the valve 9, which forces the salt solution back to the vessel 7. The washed amide is finally melted and run off. A modified process is described in which the solution of sodium cyanide is so concentrated that the sodium dissolves to a solution which floats on the cyanide solution.

Note.—Abstracts of the following specifications which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention :—201,540 (Soc. of Chemical Industry in Basle) relating to manufacture of sulphurised dyestuffs and intermediate products, see Vol. IX, p. 350 ; 202,985 (F. Noll) relating to manufacture of durable compounds containing active oxygen, see Vol. IX, p. 466 ; 203,301 (G. F. Lloyd, F. B. Clapp, and F. H. Campbell) relating to manufacture of white lead, see Vol. IX, p. 493 ; 205,103 (E. G. R. Angel) relating to electrolysis of salt solutions and production of pure table salt, see Vol. IX, p. 638 ; 211,096 (O. L. Christenson) relating to production of ammonium chloride from hot distillation or generator gases, see Vol. X, p. 417 ; 214,222 (A. S. Ramage) relating to low temperature distillation, see Vol. X, p. 629 ; 217,166 (L. Lilienfeld) relating to process for producing cellulose solutions, see Vol. IX, p. 148.

International Specifications not yet Accepted

221,205. Artificial Resins. Soc. of Chemical Industry in Basle, Switzerland. International Convention date, August 30, 1923.

To obtain an artificial shellac, a natural resin such as gum-benzoin or gum-sandarac, soluble in alcohol, is mixed with a base such as ammonia or an organic base, with or without a pre-treatment of the resin with a compound containing active methylene groups or with agents imparting elasticity. Alternatively, artificial resins may be employed, such as phenol-sulphur resins, phenol-aldehyde or phenol-ketone condensation products, polymerized aldehyde resins, polymerized lactic acid or glycollic acid resins, oxidation products of toluene, etc. Wax, rubber, esters, etc., may also be added to impart elasticity. In an example phenol-sulphur resin is treated with formaldehyde in presence of cyclohexylamine, and beeswax is added and the resin hardened. Other examples of artificial resins are obtained from phenol-sulphur resin, formaldehyde ammonia, Japan wax, and a solution of india-rubber. In other cases, the wax may be replaced by resino-tannol ester, an acylated sulphur-phenol resin such as the benzoyl ester, tricresyl-phosphate, cetyl alcohol, or benzyl benzoate. A phenol-sulphur resin may be treated with formaldehyde and dimethylcyclo-hexylamine, mixed with beeswax and rubber solution, and with ethylamine. Other examples are also given.

221,209. Alumina. R. Jacobsson, Kagerod, Sweden. International Convention date, August 29, 1923.

Raw aluminous material is dissolved in hot sulphuric acid of such concentration that when the filtered solution is cooled, all the water is fixed as water of crystallisation. The water is then evaporated in vacuo without fusing the sulphate, leaving a highly porous anhydrous sulphate, which is heated to yield a highly porous oxide. To purify the product from iron, the iron oxide is reduced by reducing gases or by adding aluminium, and the iron is then removed by heating in chlorine or aluminium chloride.

221,226-7. Thymol. G. Austerweil, 113, Boulevard Jean-Jaures, Boulogne, France. International Convention dates, August 31, and August 30, 1923.

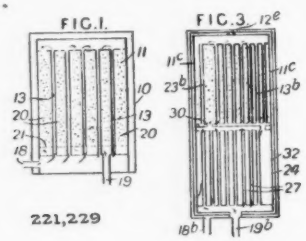
221,226. To obtain thymol, 2-cymidine is coupled with an aromatic diazo compound, the diazoamino dye is isomerized to the aminoazo form, the free amino group eliminated, the product reduced to obtain 5-cymidine, and the amino group replaced with the hydroxyl group by diazotization and boiling. The isomerization and diazotization steps may be combined by adding the isomerizing agent and its hydrochloride to the mixture of 2-cymidine and aromatic diazo compound. If the acetyl derivative of 2-cymidine is employed as the starting material, isomerizing is unnecessary. The acetyl group is removed by saponification. In an example, sulphanilic acid is diazotized, mixed with 2-cymidine, the diazoamino dye is filtered off, and then heated with aniline and its hydrochloride. The amino group is then eliminated by diazotization and reduction, and the product treated with sodium hydro-sulphite, titanous chloride or stannous chloride. Sulphanilic acid is precipitated, and the remaining 5-cymidine is extracted with benzene, the hydrochloride precipitated, diazotized and boiled to obtain thymol. Another example is given, starting with naphthylamine sulphonic acid.

221,227. *p*-cymene is converted into 2-nitrocymene, reduced to compounds such as azoxycymene or cymylhydroxylamine containing an oxygen atom attached to a nitrogen atom, and the product isomerized with an acid so that the oxygen atom moves as a hydroxy group to the ortho or para position to the nitrogen-containing group, and this group is then eliminated. Thymol is obtained. In an example, 2-nitrocymene is reduced either electrolytically in alkaline suspension or with sodium in alcoholic solution to obtain azoxycymene. This is separated and heated with concentrated sulphuric acid, and the mixture of *o*- and *p*-oxyazocymenes is neutralised and treated with sodium hydrosulphite. 2-cymidine and *o*- and *p*-aminothymols are produced, and the bases are extracted with benzene, separated by vacuum distillation, and the amino group eliminated.

221,229. AMMONIA SYNTHISIS. Synthetic Ammonia and Nitrates, Ltd., Billingham, Stockton-on-Tees. (Assignees of W. H. Kniskern, Syracuse, N.Y., U.S.A.) International Convention date, September 1, 1923.

The heat developed in the synthesis of ammonia is absorbed by passing the cold mixture of nitrogen and hydrogen through a number of tubes embedded in the catalytic material, and sometimes also around the reaction chamber.

The gaseous mixture enters by a pipe 18, passes through tubes 13 embedded in the catalyst 20, and then downwards



through the catalyst to the outlet 19. The gas may pass first through a surrounding jacket before entering the pipe 18. A heat interchanger may be combined with the reaction chamber, so that the gas, after entering at the inlet 18*b* passes through an outer jacket to the aperture 12*e*, and then downwards through an inner jacket. The gas then passes upwards around the tubes 27 of a heat interchanger, to the tubes 13*b* embedded in the catalyst. After passing through these tubes to cool the catalyst, the gas passes downwards through the catalyst to an aperture 30 and thence through the tubes 27 of the heat interchanger.

221,487. SILICA GELS. Farbenfabriken vorm. F. Bayer and Co., Leverkusen, near Cologne, Germany. International Convention date, September 3, 1923. Addition to 205,081 (see THE CHEMICAL AGE, Vol. IX, p. 638).

An insoluble silicate is first made into a silica sol which is separated from the insoluble products and allowed to gelatinize. Slag sand may be stirred into a mixture of hydrochloric acid and ice, and the mixture filtered and the sol allowed to gelatinize.

LATEST NOTIFICATIONS.

223,898. Method of manufacturing fatty acids. Welter, A October 23, 1923.

223,911. Manufacture of condensation products of the anthraquinone series. Soc. of Chemical Industry in Basle. October 26, 1923.

223,918. Manufacture of hydrogen cyanide. Deutsche Gold- und Silberscheideanstalt vorm. Rossler. December 2, 1922.

223,919. Process for the manufacture of ammonia and ammonia compounds from cyanamides. Fabrique Nationale de Produits Chimiques et d'Explosifs-Anciens Etablissements Ghinigonet et Delattre Soc. Anon. October 23, 1923.

Specifications Accepted with Date of Application

201,922. Phosphorescent zinc sulphide, Process for the production of. "Allchemin" Algemeine Chemische Industrie Akt.-Ges., and R. Jahoda. August 2, 1922.

202,631. Mercury derivatives of hydroxy-sulpho-benzoic acids and their homologues, Process for the production of solutions of—suitable for use in therapeutics. Chemosan Akt.-Ges. August 17, 1922.

207,553. Vat colouring matters, Production of. Kalle and Co., Akt.-Ges. November 25, 1922.

215,789. Ammonia, Process of making—by catalysis. Brunner, Mond and Co., Ltd. May 12, 1923.

219,277. Caoutchouc, gutta-percha, balata, and analogous vegetable resins, Manufacture of. K. D. P., Ltd. July 17, 1923. Addition to 213,886.

223,271. Volatilizing and oxidising minerals, Method and apparatus for. E. C. R. Marks. (*Cobb Electro Reduction Corporation of Canada, Ltd.*) June 11, 1923.

223,297. Fuel distillation. Electrical Improvements, Ltd., and E. G. Weeks. July 17, 1923.

223,302. Heat treatment of solid carbonaceous materials, and the manufacture of briquettes. B. Laing and H. Nielsen. July 17, 1923.

223,347. Adjustable centrifugal machine for emulsifying. E. M. Ferns, E. W. R. Stapley, and J. Harrison. August 9, 1923.

223,387. Low temperature fuel distillation. Merz and McLellan and E. G. Weeks. October 3, 1923.

223,410. Diarylguanidines, Manufacture of. British Dyestuffs Corporation, Ltd., C. J. T. Cronshaw, W. J. S. Naunton, and S. J. Green. November 1, 1923.

223,481. Mordant dyestuffs, Manufacture of. Durand and Huguenin Akt.-Ges. March 3, 1924. Addition to 197,940.

223,489. Preliminary treatment or purification of illuminating or coke-oven gases and the like intended to be subjected to partial liquefaction for the separation of their constituents. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. November 20, 1923.

211,111. Vanadium compounds or vanadium from pig iron containing vanadium, Process for obtaining. R. H. von Seth. February 9, 1923.

Applications for Patents

Compagnie Générale des Produits Chimiques des Louvres. Mechanical roasting of ore. 25,799. October 29. (France, October 30, 1923.)

Farbwerke vorm. Meister, Lucius, and Brüning. Manufacture of Bz-2¹-oxybenzanthrones. 25,597. October 27. (Germany, November 9, 1923.)

Harris, J. E. G., Jones, J. I. M., Morton, J., Morton Sundour Fabrics, Ltd., and Wylam, B. Dyes and dyeing. 26,086. November 1.

Kalle and Co., Akt.-Ges., and Sokal, S. Process for producing sulphur dyestuffs fast to chlorine. 26,091. November 1.

Remfry, F. G. P. Purification of liquids. 25,530. October 27.

Scottish Dyes, Ltd., Smith, W., and Thomas, J. Colouring-matters. 25,550. October 27.

Soc. l'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. Manufacture of hydrogen. 25,995. October 31. (France, May 15.)

Patents Court Case

APPLICATION has been made under Section 24 of the Patents and Designs Acts, 1907 and 1919, for the following patent to be endorsed "Licences of Right":—216,198 (E.C.R. Marks—Nitrogen Corporation) relating to a process for the manufacture of steel and fixation of nitrogen.

Alleged False Customs Declaration

AT the Mansion House Police Court on November 4, Charles Gray, of 49, Grange Road, Leigh-on-Sea, appeared in answer to an adjourned summons, charging him with having on May 16, 1923, caused to be made a false declaration as to the value of scientific glassware imported from Germany.

Gray, as reported in THE CHEMICAL AGE, was last week committed for trial in connection with a similar offence alleged to have been committed on April 24, 1923. Both consignments comprised various instruments and utensils for laboratory purposes, the value of which the authorities alleged had been understated by the defendant.

Counsel for the Customs said that the alleged false declaration was in respect of twenty-two cases of goods consigned to Gray himself. It would be proved that this consignment was worth about £880, whereas its value in the defendant's declaration was £74 17s. 7d.

Expert evidence was called as to the real value of the goods in question.

Gray, who pleaded not guilty and reserved his defence, was committed for trial, and bound over on his own recognisance of £200 to appear at the Court.

Japanese Dyestuffs Expansion

JAPAN'S dyestuff industry has made rapid progress since the war, according to a Tokio report to the American Chemical Society. The Oriental market is complaining of the dumping of foreign dyes. "About twenty important dyes of good quality are being supplied by the domestic dye companies," says the report. "Japan therefore needs to import only about 2,400,000 pounds of special dyes from foreign countries. Europe was a central market for the dyes, but now the balance is changed. The Oriental market is being disturbed by the dumping of the foreign dyes. Therefore the Japanese Government has taken the policy to protect her dye industry. An ordinance has been issued from the Agricultural and Commercial Department requiring merchants who wish to import coal-tar dyes and chemicals derived from fractionally distilled compounds from coal-tar, except medicines and phenol, to get permission from the Minister of the Department."

London Chemical Market

The following notes on the London Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing those firms' independent and impartial opinions.

London, November 6, 1924.

General Chemicals

BUSINESS has continued very active during the current week, and a much more hopeful feeling is in evidence. A marked feature of trade has been the inquiry on forward account, thus showing increasing confidence on the part of buyers. Prices are in the main extremely firm, with a tendency in the upward direction. Export business also continues active and inquiry is for larger quantities.

ACETONE.—Demand is only moderate, but the market is standing at the price of £93 to £94 per ton.

ACID ACETIC has slightly declined in price, but this movement may not be of long duration; it is quoted at £43 per ton for technical 80% and £44 per ton for pure.

ACID CITRIC.—This article is still stagnant and is unchanged at about 1s. 3½d. per lb., ex warehouse.

ACID FORMIC continues moderately active, and price is unchanged at £53 per ton.

ACID LACTIC has been in much better demand and price is firm at £43 per ton for 50% by weight.

ACID OXALIC.—The improved demand continues and the present quotation of 4d. per lb. is very firm and is expected to advance.

ACID TARTARIC.—Unchanged.

ALUMINA SULPHATE.—Although the market continues in buyers' favour a stronger tendency is in evidence and price is still unchanged at £7 5s. per ton for 17/18%.

ARSENIC continues somewhat flat, but there is a very small export inquiry now in the market. Price nominally unchanged for Cornish.

BARIUM CHLORIDE is in good demand, and the price is firm at £12 10s. to £13 per ton.

COPPER SULPHATE.—This article is very firm, and good business is reported at round about £23 per ton.

CREAM OF TARTAR is unchanged at £80 per ton, market is firmer.

FORMALDEHYDE is easy, and the demand only moderate at £48 per ton, ex wharf.

EPSOM SALTS are inclined to be scarce and dearer in price. Demand is very active, and price is round about £4 5s. per ton.

LEAD ACETATE is again higher, and there is a brisk demand at £45 10s. to £47 for the white and £46 per ton for brown.

LEAD NITRATE.—This article is very firm and is quoted at £43 10s.

LIME ACETATE continues weak and price is easy at £14 per ton for grey and £11 per ton for brown. There is a general feeling, however, that the price is now about as low as can be expected.

MAGNESIUM CHLORIDE is unchanged.

METHYL ALCOHOL has been in somewhat better demand and is quoted at £60 to £62 per ton.

POTASSIUM CAUSTIC is unchanged, and in fair request.

POTASSIUM CARBONATE has a fair marker at £24 per ton, and the demand seems to be on the increase.

POTASSIUM PERMANGANATE has eased off somewhat, and is now quoted at 7¼d. per lb.

POTASSIUM PRUSSIATE has been a strong market, and a good business is reported at 7½d. per lb.

SODIUM ACETATE has been fairly active and the price is round about £22 per ton for quantities.

SODIUM BICHROMATE is unchanged at 4½d. per lb.

SODIUM HYPOSULPHITE has been quite active, and is in good demand at about £9 5s. to £9 10s. according to quantity and position.

SODIUM NITRITE is firmer and the demand is brisk at £25 per ton.

SODIUM PRUSSIATE.—Some good business is reported, and price is firm at 4d. to 4¼d. per lb.

SODIUM SULPHIDE unchanged for both crystals and concentrated with a normal demand.

Coal Tar Products

There is little change in the market for coal tar products since last week, business being rather quiet.

90% BENZOL is firm and somewhat scarce, for prompt delivery. Its value remains at about 1s. 4d. to 1s. 5d. per gallon on rails.

PURE BENZOL is steady at 1s. 7d. to 1s. 8d. per gallon on rails.

CREOSOTE OIL.—The demand for this product shows a slight improvement on last week, although the price remains unchanged. Its value is about 5¼d. to 5½d. per gallon on rails in the North, and in the South the price is 6d. to 6¼d. per gallon.

CRESYLIC ACID is unchanged from last week, the pale quality 97/99% being worth 1s. 11d. per gallon on rails, while the dark quality 95/97% is quoted at 1s. 7d. to 1s. 7½d. per gallon.

SOLVENT NAPHTHA is steady at 1s. 1d. to 1s. 2d. per gallon on rails.

HEAVY NAPHTHA is quoted at 11d. to 1s. per gallon on rails.

NAPHTHALENES are dull, the low qualities being quoted from £3 10s. to £4 10s. per ton, while of the higher grades, 76/78 quality is worth from £6 to £6 10s. per ton, and 74/76 £5 10s. to £6 per ton.

PITCH.—Business has slackened off somewhat, but prices are maintained. Present values are :—London, 47s. 6d. to 50s. f.o.b.; East Coast, 42s. 6d. to 47s. 6d. f.o.b.; West Coast, 42s. 6d. to 47s. 6d. f.o.b.

Nitrogen Products Market

Export.—There is no change in the position and prices remain unchanged at £13 15s. per ton f.o.b. for prompt delivery and £14 to £14 10s. per ton f.o.b. for forward.

Home Trade.—The prices for November and December were announced in last week's report and small sales are being made at these prices.

Nitrate of Soda.—The market for nitrate of soda is unchanged; the price for near arrival is from £11 13s. to £11 16s. per ton with prices slightly in advance for forward shipment. Considerable sales have been made for delivery up to April, 1925, and it is quite likely that the market will become firmer as the season advances.

American Market Movements

(From *Drug and Chemical Markets.*)

DEMAND for industrial chemicals has been showing a steady improvement. Price changes have been comparatively few, the majority of products holding steady at recent values. Increased activity is reported in consuming industries. Caustic potash prices are higher and firm. Barium chloride is weak. Selling competition and slow demand in cresylic acid have resulted in slower quotations in the market. Buying in intermediates is reported improving with prices holding steady. With textile mills showing increased activity the call for dyes is reported better. Benzol continues scarce and firm in price. Rising flaxseed prices and scarcity of spot oil have caused crushers to advance prices of linseed oil 3 cents per gallon. Crude cottonseed oil is higher. Menhaden oil is scarce and firm at season's peak price. Edible oils are in demand. Turpentine is easier. Rosins have advanced.

Fine chemicals are in active demand with few exceptions. Codliver oil is scarce on spot. Menthol is quoted at $8.75 lb. c.i.f. for January-March shipment. Mercury is easy. Fusel oil is firm.

Essential oils show a tendency to ease off owing to the high prices asked for a number of items. Buyers say that prices are too high, and that they can afford to wait for them to come down. Oil cedar wood registers a new high. Oil lemon is higher.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at sellers' works.

General Heavy Chemicals

Acid Acetic 40% Tech.—£23 10s. per ton.

Acid Boric, Commercial.—Crystal, £45 per ton. Powder, £47 per ton

Acid Hydrochloric.—3s. 9d. to 6s. per carboy d/d., according to purity, strength and locality.

Acid Nitric 80° Tw.—£21 10s. to £27 per ton, makers' works according to district and quality.

Acid Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 65s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.

Bleaching Powder.—Spot, £11 d/d.; Contract, £10 d/d. 4 ton lots

Bisulphite of Lime.—£7 10s. per ton, packages extra.

Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)

Calcium Chloride.—£5 17s. 6d. per ton d/d.

Copper Sulphate.—£25 per ton.

Methylated Spirit 64 O.P.—Industrial, 2s. 7d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.

Nickel Sulphate.—£38 per ton d/d. Normal business.

Nickel Ammonia Sulphate.—£38 per ton d/d. Normal business.

Potash Caustic.—£30 to £33 per ton.

Potassium Bichromate.—5½d. per lb.

Potassium Chlorate.—3d. to 4d. per lb.

Salammoniac.—£32 per ton d/d.

Salt Cake.—£3 10s. per ton d/d.

Soda Caustic, Solid.—Spot lots delivered, £16 7s. 6d. to £19 7s. 6d per ton, according to strength; 20s. less for contracts.

Soda Crystals.—£5 5s. to £5 10s. per ton ex railway depots or ports.

Sodium Acetate 97/98%.—£24 per ton.

Sodium Bicarbonate.—£10 10s. per ton carr. paid.

Sodium Bichromate.—4½d. per lb.

Sodium Bisulphite Powder 60/62%.—£17 to £18 per ton, according to quantity, f.o.b., 1-cwt. iron drums included.

Sodium Chlorate.—3d. per lb.

Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton, ex Liverpool. Nominal.

Sodium Nitrite 100% basis.—£27 per ton d/d.

Sodium Sulphide conc. 60/65.—About £14 10s. per ton d/d.

Sodium Sulphide Crystals.—£9 per ton d/d.

Sodium Sulphite, Pea Crystals.—£15 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—6½d. per lb. Quiet. Crude 60's 1s. 8d. to 1s. 10d. per gall. Market flat.

Acid Cresylic 97/99.—2s. to 2s. 1d. per gall. Demand steady. Pale 95%, 1s. 8d. to 2s. per gall. Not much inquiry. Dark, 1s. 8d. to 1s. 10d. per gall. Market dull.

Anthracene Paste 40%.—4d. per unit per cwt. Nominal price. No business.

Anthracene Oil, Strained.—6½d. to 7½d. per gall. Small demand. Unstrained, 6d. to 6½d. per gall.

Benzol.—Crude 65's.—7½d. to 9d. per gall., ex works in tank wagons. Standard Motor, 1s. 1½d. to 1s. 3d. per gall., ex works in tank wagons. Pure, 1s. 5½d. to 1s. 7d. per gall., ex works in tank wagons.

Toluol.—90%, 1s. 5d. to 1s. 6d. per gall. Demand good. Pure, 1s. 7d. to 1s. 9d. per gall.

Xylol Commercial.—2s. 3d. per gall. Pure, 3s. 3d. per gall.

Creosote.—Cresylic, 20/24%, 8d. to 8½d. per gall. Little demand. Middle Oil, Heavy, Standard specification, 5½d. to 6½d. per gall., according to quality and district. A little more demand for export in bulk.

Naphtha.—Crude, 8d. to 9d. per gall. Solvent 90/160, 1s. to 1s. 3d. per gall. Demand good. Solvent 90/190, 11d. to 1s. per gall. Fair inquiry. Local demand good.

Naphthalene Crude.—Demand rather better. Cheaper in Yorkshire than in Lancashire. Drained Creosote Salts, £3 to £5 per ton. Demand slightly better. Whizzed or hot pressed, £6 to £9 per ton. Demand very poor.

Naphthalene.—Crystals and Flaked, £12 to £15 per ton, according to district.

Pitch.—Medium soft, 42s. 6d. to 60s. per ton. Plenty of inquiry, prospects brighter. Price too low to interest distillers.

Pyridine.—90/160, 19s. per gall. Steady demand. Heavy, 11s. to 12s. Market dull.

Intermediates and Dyes

Business in dyestuffs has been very well maintained this week. There have been no alterations in prices to report.

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 7d. per lb.

Acid H.—3s. 11d. per lb. 100% basis d/d.

Acid Naphthionic.—2s. 4d. per lb. 100% basis d/d.

Acid Neville and Winther.—5s. 8d. per lb. 100% basis d/d.

Acid Salicylic, technical.—1s. 1d. per lb. Improved demand.

Acid Sulphanilic.—9d. per lb. 100% basis d/d.

Aluminium Chloride, anhydrous.—1s. per lb. d/d.

Aniline Oil.—8d. per lb. naked at works.

Aniline Salts.—8½d. per lb. naked at works.

Antimony Pentachloride.—1s. per lb. d/d.

Benzidine Base.—3s. 11d. per lb. 100% basis d/d.

Benzyl Chloride 95%.—1s. 1d. per lb.

***p*-Chlorphenol.**—4s. 3d. per lb. d/d.

***p*-Chloraniline.**—3s. per lb. 100% basis.

***o*-Cresol 19/31° C.**—4½d. per lb. Rather quiet.

***m*-Cresol 98/100%.**—2s. 1d. to 2s. 3d. per lb. Demand moderate.

***p*-Cresol 32/34° C.**—2s. 1d. to 2s. 3d. per lb. Demand moderate.

Dichloraniline.—2s. 3d. to 3s. per lb.

Dichloraniline S. Acid.—2s. 6d. per lb. 100% basis.

***p*-Dichlorbenzol.**—£85 per ton.

Diethylaniline.—4s. 3d. per lb. d/d., packages extra, returnable.

Dimethylaniline.—2s. 2½d. per lb. d/d. Drums extra.

Dinitrobenzene.—9d. to 10d. per lb. naked at works.

Dinitrochlorbenzol.—£84 10s. per ton d/d.

Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works 66/68° C. 1s. 2d. per lb. naked at works.

Diphenylaniline.—2s. 10d. per lb. d/d.

Monochlorbenzol.—£63 per ton.

***B*-Naphthol.**—1s. per lb. d/d.

***a*-Naphthylamine.**—1s. 3½d. per lb. d/d.

***B*-Naphthylamine.**—4s. per lb. d/d.

***m*-Nitraniline.**—4s. 2½d. per lb. d/d.

***p*-Nitraniline.**—2s. 2½d. per lb. d/d.

Nitrobenzene.—5½d. to 5¾d. per lb. naked at works.

***o*-Nitrochlorbenzol.**—2s. per lb. 100% basis d/d.

Nitronapthalene.—10½d. per lb. d/d.

***p*-Nitrophenol.**—1s. 9d. per lb. 100 % basis d/d.

***p*-Nitro-*o*-amido-phenol.**—4s. 6d. per lb. 100% basis.

***m*-Phenylene Diamine.**—3s. 10d. per lb. d/d.

***p*-Phenylene Diamine.**—10s. 2d. per lb. 100% basis d/d.

R. Salt.—2s. 4d. per lb. 100% basis d/d.

Sodium Naphthionate.—2s. 2d. per lb. 100% basis d/d.

***o*-Toluidine.**—10d. per lb.

***p*-Toluidine.**—3s. per lb. naked at works.

***m*-Toluylene Diamine.**—3s. 10d. per lb. d/d.

Wood Distillation Products

There is a general feeling that the fall in price of acetates during the last few weeks has reached its limit. The tendency is now to stiffen again.

Acetate of Lime.—Brown £11 10s. per ton d/d. and upward. Grey £14 per ton. Liquor, 9d. per gall. 32° Tw.

Charcoal.—£7 5s. to £9 per ton, according to grade and locality. Demand quiet, but price steady.

Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall. 24° Tw

Red Liquor.—10d. to 1s. per gall. 14/15° Tw.

Wood Creosote.—2s. 9d. per gall. Unrefined.

Wood Naphtha, Miscible.—4s. 9d. per gall. 60% O.P. Solvent, 5s. per gall. 40% O.P. Firmer.

Wood Tar.—£4 to £5 per ton. Very quiet.

Brown Sugar of Lead.—£41 per ton. Steady market.

Rubber Chemicals

Antimony Sulphide.—Golden, 6½d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.

Arsenic Sulphide, Yellow.—1s. 11d. per lb.

Barytes.—£3 10s. to £6 15s. per ton, according to quality.

Cadmium Sulphide.—3s. 9d. to 4s. per lb., according to quantity.

Carbon Bisulphide.—£30 to £33 per ton, according to quantity. Again dearer.

Carbon Black.—7d. to 7½d. per lb., ex-wharf. Dearer.

Carbon Tetrachloride.—£60 to £65 per ton, according to quantity, drums extra. Again dearer.

Chromium Oxide, Green.—1s. 3d. per lb.

Indiarubber Substitutes, White and Dark.—5d. to 9½d. per lb Demand very brisk. Prices likely to remain steady owing to firmness of rapeseed oils.

Lamp Black.—£48 per ton, barrels free.

Lead Hyposulphite.—7½d. per lb.

Lithopone, 30%.—£22 10s. per ton.

Mineral Rubber "Rubpron."—£16 5s. per ton f.o.r. London.

Sulphur.—£10 to £12 per ton, according to quality.
Sulphur Chloride.—4d. per lb., carboys extra. Dearer.
Sulphur Precip. B.P.—£47 10s. to £52 10s. per ton according to quantity.
Thiocarbanilide.—2s. 6d. per lb.
Vermilion, Pale or Deep.—5s. 1d. per lb. Dearer.
Zinc Sulphide.—7½d. to 1s. 8d. per lb., according to quality

Pharmaceutical and Photographic Chemicals

Acid, Acetic 80% B.P.—£43 to £45 per ton ex wharf London in glass containers.
Acid, Acetyl Salicylic.—3s. 1d. to 3s. 3d. per lb., according to quantity. Sales steady. Price firm.
Acid, Benzoic B.P.—2s. 6d. per lb. Cheaper.
Acid, Boric B.P.—Crystal £51 per ton, Powder £55 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 4d. per lb., less 5% for ton lots. Market still weak.
Acid, Gallic.—2s. 9d. per lb. for pure crystal, in 2 cwt. lots.
Acid, Pyrogallic, Crystals.—6s. 9d. per lb. for 1 cwt. lots. Market firm. Increasing demand.
Acid, Salicylic.—1s. 6d. to 1s. 8d. per lb , according to quantity.
Acid, Tannic B.P.—2s. 10d. per lb. Forward quotations higher. Spot value likely to increase.
Acid, Tartaric.—1s. per lb., less 5%.
Amidol.—9s. per lb. d/d.
Acetanilide.—2s. per lb. for quantity. More inquiry.
Amidopyrin.—15s. per lb. for spot stocks.
Ammonium Benzoate.—3s. 3d. to 3s. 6d. per lb., according to quantity.
Ammonium Carbonate B.P.—£37 per ton.
Atropine Sulphate.—12s. 6d. per oz. for English make.
Barbitone.—13s. 9d. per lb. Slightly lower. Quiet steady demand.
Benzonaphthol.—5s. 3d. per lb. Small inquiry.
Bismuth Salts.—Prices reduced by about 1s. 3d. to 2s. 3d. per lb. on account of the fall in the price of the metal.
Bismuth Carbonate.—10s. 6d. to 12s. 6d. per lb.
Bismuth Citrate.—10s. 3d. to 12s. 3d. per lb.
Bismuth Salicylate.—9s. od. to 11s. od. per lb.
Bismuth Subnitrate.—9s. 8d. to 10s. 8d. per lb.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Potassium, 1s. 9d. per lb.; sodium, 1s. 10d. per lb.; ammonium, 1s. 11d. per lb. Market firm and prices advancing. Raw materials dearer. British prices lower.
Calcium Lactate—1s. 7d. to 2s., according to quantity. Fair demand and steady market.
Chloral Hydrate.—4s. per lb. Slightly easier.
Chloroform.—2s. 6d. per lb. for cwt. lots. Price advanced by 6d. per lb.
Creosote Carbonate.—6s. 6d. per lb. Little demand.
Formaldehyde.—£48 to £49 per ton, in barrels ex wharf London.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 50%, 2s. 6d. per lb.
Guaiacol Carbonate.—10s. per lb.
Hexamine.—3s. per lb. Forward prices higher.
Homatropine Hydrobromide.—30s. per oz.
Hydrastine Hydrochloride.—English make offered at 120s. per oz.
Hydroquinone.—4s. 3d. per lb. in cwt. lots. Foreign make.
Hypophosphites.—Calcium, 3s. 6d. per lb., for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—2s. 1d. to 2s. 5d. per lb., according to quantity.
Magnesium Carbonate.—Light Commercial, £36 per ton net.
Magnesium Oxide.—Light Commercial, £75 per ton, less 2½%; Heavy Commercial, £25 per ton, less 2½%; Heavy Pure, 1s. 6d. to 2s. per lb., according to quantity. Steady market.
Menthol.—A.B.R. recrystallised B.P., 62s. 6d. per lb. Market much firmer. Synthetic, 26s. to 35s. per lb. Increasing demand.
Mercurials.—Market very quiet. Red oxide, 5s. 3d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 6d. to 3s. 7d. per lb.; white precipitate, 4s. 7d. to 4s. 8d. per lb.; Calomel, 3s. 11d. to 4s. per lb.
Methyl Salicylate.—1s. 9d. to 2s per lb. Seasonal increase in demand.
Methyl Sulphonel.—24s. per lb. Slightly weaker.
Metol.—11s. per lb. British make.
Morphine and Salts.—Reduced by 1s. to 1s. 3d. per oz.
Paraformaldehyde.—2s. 8d. for B.P. Quality.
Paraldehyde.—1s. 4½d. to 1s. 6d. per lb., in free bottles and cases.
Phenacetin.—5s. 8d. per lb.
Phenazone.—6s. 10d. per lb. Supply exceeds demand.
Phenolphthalein.—5s. 9d. per lb.
Potassium Bitartrate 99/100% (Cream of Tartar).—84s. per cwt. less 2½% for ton lots.
Potassium Citrate.—1s. 10d. to 2s. 2d. per lb. Dearer.
Potassium Ferricyanide.—1s. 9d. per lb. Quiet.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity. Good steady demand.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included, f.o.r. London.
Potassium Permanganate.—B.P. crystals, 7½d. per lb., carriage paid; commercial, 8d. to 8½d. per lb., carriage paid. Forward prices higher.
Quinine Sulphate.—2s. 3d. to 2s. 4d. per oz., in 100 oz. tins. Good market.
Resorcin.—5s. 6d. per lb.
Saccharin.—63s. per lb. in 50-lb. lots.
Salol.—3s. 9d. per lb., for cwt. lots.
Silver Proteinate.—9s. per lb. for satisfactory product light in colour.
Sodium Benzoate, B.P.—2s. 6d. per lb. Ample supplies of good quality available.
Sodium Citrate, B.P.C., 1923.—1s. 11d. to 2s. 2d. per lb., according to quantity.
Sodium Hypophosphite, Photographic.—£13 to £15 per ton. according to quantity, d/d. consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb. Less for quantity.
Sodium Potassium Tartrate (Rochelle Salt).—75s. to 82s. 6d. per cwt., according to quantity. Market steady, good demand.
Sodium Salicylate.—Powder, 2s. to 2s. 3d. per lb. Crystal, 2s. 2d. to 2s. 5d. per lb. Flake, 2s. 6d. per lb.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb., according to quantity.
Sodium Sulphite, anhydrous, £27 10s. per ton, minimum 5 ton lots, according to quantity, 1 cwt. kegs included.
Sulphonal.—15s. 6d. per lb. Little demand.
Thymol.—16s. per lb.

Perfumery Chemicals

Acetophenone.—12s. per lb.
Aubepine.—15s. 3d. per lb. Advanced.
Amyl Acetate.—2s. 9d. per lb. Dearer.
Amyl Butyrate.—6s. 9d. per lb.
Amyl Salicylate.—3s. 3s. per lb. Dearer.
Anethol (M.P. 21/22° C.).—4s. 6d. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. 9d. per lb.
Benzyl Alcohol free from Chlorine.—2s. 9d. per lb.
Benzaldehyde free from Chlorine.—3s. 6d. per lb.
Benzyl Benzoate.—3s. 6d. per lb.
Cinnamic Aldehyde Natural.—18s. 9d. per lb. Advanced.
Coumarin.—19s. 6d. per lb. Cheaper.
Citronellol.—17s. per lb. Again advanced.
Citral.—8s. per lb. Cheaper.
Ethyl Cinnamate.—12s. 6d. per lb. Cheaper.
Ethyl Phthalate.—3s. 3d. per lb.
Eugenol.—10s. per lb. Cheaper.
Geraniol (Palmarosa).—33s. 6d. per lb.
Geraniol.—11s. 6d to 18s. 6d. per lb.
Heliotropine.—6s. 9d. per lb. Cheaper.
Iso Eugenol.—16s. per lb. Dearer.
Linalol ex Bois de Rose.—26s. per lb.
Linalyl Acetate.—26s. per lb.
Methyl Anthranilate.—9s. 6d. per lb.
Methyl Benzoate.—5s. per lb.
Musk Ambrette.—50s. per lb. Dearer.
Musk Xylol.—13s. 6d. per lb. Again cheaper.
Nerolin.—4s. 9d. per lb. Advanced.
Phenyl Ethyl Acetate.—15s. per lb. Advanced.
Phenyl Ethyl Alcohol.—16s. per lb.
Rhodinol.—55s. per lb. Cheaper.
Safrol.—1s. 10d. per lb.
Terpineol.—2s. 4d. per lb. Cheaper.
Vanillin.—25s. 6d. per lb.

Essential Oils

Almond Oil, Foreign S.P.A.—15s. 6d. per lb.
Anise Oil.—2s. 10d. per lb. Dearer.
Bergamot Oil.—16s. 6d. per lb.
Bourbon Geranium Oil.—33s. 6d. per lb. Cheaper.
Camphor Oil.—65s. per cwt.
Cananga Oil, Java.—10s. per lb. Cheaper.
Cinnamon Oil, Leaf.—6½d. per oz.
Cassia Oil, 80/85%.—10s. per lb. Dearer.
Citronella Oil.—Java, 85/90%, 6s. 10½d. per lb. Dearer. Ceylon, 3s. 8d. per lb.
Clove Oil.—8s. per lb. Dearer.
Eucalyptus Oil, 70/75%.—2s. 3d. per lb. Cheaper.
Lavender Oil.—French 38/40% Esters, 32s. 6d. per lb.
Lemon Oil.—3s. per lb.
Lemongrass Oil.—4s. 6d. per lb.
Orange Oil, Sweet.—11s. per lb.
Otto of Rose Oil.—Bulgarian, 40s. per oz. Dearer. Anatolian, 18s. per oz.
Palma Rosa Oil.—16s. 6d. per lb. Cheaper.
Peppermint Oil.—Wayne County, 30s. per lb. Japanese, 18s. 6d. per lb. Practically unobtainable for spot or near delivery. English, 70s. per lb.
Petitgrain Oil.—9s. 6d. per lb. Dearer.
Sandal Wood Oil.—Mysore, 26s. 7d. per lb. Australian, 18s. 6d. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, November 6, 1924.

DURING the past week business in the heavy chemical market has been a little more active, a fair number of inquiries being received. Prices for some products, notably caustic potash, have an upward tendency, but on the whole they are on about the same level as last reported.

Industrial Chemicals

ACID ACETIC.—Glacial 98/100%, £57 to £68 per ton; 80% pure, £45 to £47 per ton; 80% technical, £44 to £46 per ton. All packed in casks delivered c.i.f. U.K. ports, duty free.

ACID BORACIC.—Remains unchanged. Crystal or granulated, £45 per ton; powdered, £47 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—Still further reduced in price. Now on offer at about 5¼d. per lb. delivered.

ACID CITRIC B.P. CRYSTALS.—Unchanged at about 1s. 3½d. per lb. less 5% ex store. Offered for early delivery at about 1s. 3d. per lb. less 5% ex wharf.

ACID FORMIC, 85%.—Spot material on offer at about £54 per ton ex store. Quoted £50 to £51 per ton c.i.f. U.K. ports, duty free.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy ex works.

ACID NITRIC, 80°.—£23 10s. per ton ex station, full truck loads.

ACID OXALIC, 98/100%.—Quoted for prompt shipment from the continent, 3¾d. per lb. c.i.f. U.K. port. Spot lots now quoted 3⅞d. per lb. ex store.

ACID SULPHURIC.—144°, £3 12s. 6d. per ton; 168°, £7 per ton ex works, full truck loads. Dearsenicated quality 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Nominally 1s. per lb. less 5% ex store, but could probably be obtained for less.

ALUMINA SULPHATE, 17/18% IRON FREE.—Quoted £6 17s. 6d. per ton c.i.f. U.K. port, prompt shipment. Spot lots available at about £7 17s. 6d. per ton ex store.

ALUM.—Ammonium chrome alum, £18 to £20 per ton according to quality f.o.b. U.K. port. Lump potash alum now quoted £8 5s. per ton c.i.f. U.K. port. Spot lots on offer at about £9 10s. per ton ex store.

AMMONIA ANHYDROUS.—Unchanged at about 1s. 6d. per lb. ex station. Containers extra and returnable, with possible slight reduction for large quantities.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton, packed in 5-cwt. casks delivered U.K. port.

AMMONIA LIQUID, 880°.—In steady demand. Unchanged at 2½d. to 3d. per lb. delivered, according to quantity, containers extra.

AMMONIA MURIATE.—Grey galvanisers' crystals of English manufacture unchanged at £30 per ton ex station. Offered from the continent at about £28 per ton c.i.f. U.K. port. Fine white crystals offered from the continent at £24 10s. per ton c.i.f. U.K. port.

ARSENIC, WHITE POWDERED.—Nominally £46 per ton ex store. Japanese arsenic on offer at about £33 per ton c.i.f. U.K. port, prompt shipment.

BARIUM CARBONATE, 98/100% POWDERED.—Offered from the continent at £9 15s. per ton c.i.f. U.K. port.

BARIUM CHLORIDE, 98/100%.—Spot lots quoted £12 17s. 6d. per ton ex store. Offered for prompt shipment from the continent at about £11 15s. per ton c.i.f. U.K. port.

BARYTES.—English material unchanged at £5 5s. per ton ex works. Continental quoted £5 per ton c.i.f. U.K. port.

BLEACHING POWDER.—Spot lots £11 per ton ex station, contracts 20s. per ton less.

BORAX.—Granulated, £24 10s. per ton; crystals, £25 per ton; powdered, £26 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English material unchanged at £5 12s. 6d. per ton ex station. Slightly cheaper quotations from the continent. Now quoted £4 12s. 6d. per ton c.i.f. U.K. port.

COPPERAS, GREEN.—Unchanged at about £3 5s. per ton ex works, packed in casks, free.

COPPER SULPHATE.—English material quoted £25 per ton f.o.b. U.K. port for export. Continental on offer at about £24 per ton ex wharf.

FORMALDEHYDE, 40%.—Nominally £50 per ton ex store, but could probably be bought for less.

GLAUBER SALTS.—English material unchanged at £4 per ton ex store or station. Fine white crystals on offer from the continent at about £3 per ton c.i.f. U.K. port. Large crystals, 17s. 6d. per ton extra.

LEAD, RED.—Still further advance in price, now quoted £43 10s. per ton ex store.

LEAD, WHITE.—Offered at £45 10s. per ton ex store, spot delivery.

LEAD, ACETATE.—Spot lots available at about £46 5s. per ton ex store. Offered for early delivery at £46 per ton ex station. Brown quoted £40 10s. per ton c.i.f. U.K. port.

MAGNESITE, CALCINED.—Unchanged at about £7 17s. 6d. per ton ex station, prompt delivery. Hard burnt quality quoted £4 15s. per ton ex station. Finer quality of continental manufacture quoted £7 15s. per ton c.i.f. U.K. port.

MAGNESIUM CHLORIDE.—Quotations still unsettled. Offered for prompt shipment from the continent at about £5 5s. per ton c.i.f. U.K.

POTASH, CAUSTIC 88/92%.—Spot material available at about £31 15s. per ton ex store. Offered for prompt shipment from the continent at about £31 per ton c.i.f. U.K. port.

POTASSIUM BICHROMATE.—Unchanged at 5½d. per lb. delivered.

POTASSIUM CARBONATE, 96/98%.—Quoted £22 17s. 6d. per ton c.i.f. U.K. port, prompt shipment. Spot lots unchanged at about £24 15s. per ton ex store.

POTASSIUM CHLORATE.—Unchanged at about 2¾d. per lb. ex wharf, prompt shipment from the continent. Spot lots available at about the same figure.

POTASSIUM NITRATE, SALTPETRE.—Quoted £26 per ton c.i.f. U.K. port, prompt shipment from the continent. Spot lots on offer at £28 15s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 8d. per lb., ex store, spot delivery. Offered for prompt shipment from the continent at about 7½d. per lb., ex wharf.

POTASSIUM PRUSSIATE, YELLOW.—In little demand and obtainable at about 6⅞d. per lb., ex store, spot delivery. Offered for prompt shipment from the continent at about 6½d. per lb. c.i.f. U.K. port.

SODA CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62%, broken, £19 2s. 6d. per ton; 98/99%, powdered, £22 15s. per ton. All ex station, spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—Unchanged at about £23 15s. per ton, ex store, spot delivery. Offered from the continent at about £22 10s. per ton c.i.f. U.K. port.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station; M.W. quality, 30s. per ton less.

SODIUM BICHROMATE.—Unchanged at 4¾d. per lb. delivered.

SODIUM CARBONATE.—Soda crystals, £5 to £5 5s. per ton, ex quay or station. Powdered or pea quality, £1 7s. 6d. per ton more. Alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English material unchanged at £10 per ton, ex station. Continental quoted £8 10s. per ton, c.i.f. U.K. port. Spot lots available at about £9 15s. per ton, ex store. Pea crystals of English manufacture unchanged at £13 15s. per ton, ex station.

SODIUM NITRATE.—Ordinary quality quoted £13 17s. 6d. per ton, ex store. 96/98% refined quality, 7s. 6d. per ton extra.

SODIUM NITRITE 100%.—Unchanged at about £26 per ton, ex store.

SODIUM PRUSSIATE, YELLOW.—Quoted 4d. per lb., ex store, spot delivery, but in little demand.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption £3 10s. per ton f.o.r. works. Good inquiry for export.

SODIUM SULPHIDE.—60/65% solid, of English manufacture, £14 15s. per ton, ex station; broken £1 per ton more; flake, £2 per ton more. 60/62% solid of continental manufacture now quoted £12 17s. 6d. per ton c.i.f. U.K. port. Broken £1 per ton more. 31/34% crystals of English manufacture, £9 2s. 6d. per ton, ex station. 30/32% crystals of continental manufacture quoted £8 15s. per ton, c.i.f. U.K. port.

SULPHUR.—Flowers, £9 10s. per ton; roll, £8 10s. per ton; rock, £8 7s. 6d. per ton; ground, £8 5s. Ex store, prices nominal.

ZINC CHLORIDE.—98/100% solid, offered from the continent at about £24 5s. per ton, c.i.f. U.K. port. 96/98% quoted £23 10s. per ton c.i.f. U.K. port. English material for export about £26 per ton f.o.b. U.K. port.

ZINC SULPHATE.—Unchanged at about £12 15s. per ton, ex store, spot delivery.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ALPHA NAPHTHYLAMINE.—Home inquiries. Price 1s. 3½d. per lb. delivered.

ANTHRANILIC ACID.—Some home inquiry. Price 7s. 9d. per lb., 100% basis.

BENZALDEHYDE.—Small home inquiry. Price, 2s. 3½d. per lb. delivered.

H. ACID.—Good home and export inquiries. Price, 3s. 10½d. per lb., 100% basis delivered.

MONO NITRO TOLUENE.—Good demand. Price 8d. to 8½d. per lb. delivered.

META XYLIDINE ACETATE.—Price 3s. 9d. per lb., 100% basis, delivered.

METHYLAMINE HYDROCHLORIDE.—Small export inquiry. Price 10s. per lb., f.o.b.

PARA AMINO SALICYLIC ACID.—Some home inquiry. Price 8s. 5d. per lb., 100% basis delivered.

PARA NITRO ACETANILIDE.—Some small inquiry. Price 3s. 3d. per lb. delivered.

RESORCIN.—Some home inquiry. Price 4s. per lb. delivered.

The Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

Manchester, November 6, 1924.

So far as prices are concerned the position of the chemical market here is much the same as at last report. Arsenic and most of the coal-tar products continue weak, but sellers in respect of other lines appear to be less disposed to make concessions, and it seems reasonable to assume that on the whole prices are as low as they are likely to be. The demand for the leading heavy chemicals has been about maintained at the level of the last few weeks. Inquiry for textile chemicals is rather better.

Heavy Chemicals

Sulphide of sodium is still only in moderate request, though values are fairly steady at round £14 10s. per ton for 60-65 per cent. concentrated solid and £9 5s. for crystals. Neither saltcake nor Glauber salts is attracting much attention from buyers; quotations in both cases are, however, held at £3 10s. per ton. Caustic soda is in fairly good demand from home users and also for shipment; quotations are firm and range from £16 17s. 6d. per ton for 60 per cent. material to £19 7s. 6d. for 76-77 per cent. Bleaching powder is only moderately active, but values are unchanged at round £10 per ton. Alkali continues to meet with a fair volume of inquiry at about £6 15s. per ton. Phosphate of soda is still offering at round £13 5s. per ton, but business in this material is on a small scale. Hyposulphite of soda is quiet but steady at £13 15s. to £14 per ton for photographic crystals and about £9 5s. for commercial quality. Prussiate of soda is in slightly better demand and values are a shade stronger at 4d. per lb. Acetate of soda is held at last week's level of £22 10s. to £23 per ton, a quietly steady volume of business being put through. Soda crystals are rather quiet with quotation unchanged at about £5 5s. per ton. Bicarbonate of soda is dull at £10 10s. per ton. Bichromate of soda is steady and meets with a fair inquiry at 4¼d. per lb. Chlorate of soda is only moderately active but there is no change in value, which remains at about 2½d. per lb.

Among the potash products both caustic and carbonate are attracting only a limited amount of attention, though little or no change in prices can be reported. Caustic potash is quoted at £29 to £30 for 90 per cent. material and carbonate of potash at £22 to £22 10s. per ton. Bichromate of potash is steady and in fair demand at 5½d. per lb. Permanganate of potash is firmer at from 6¾d. to 7½d. per lb., according to quality, and a rather improved demand has been met with. Yellow prussiate of potash is selling in comparatively small quantities at round 6¾d. per lb. Chlorate of potash is quiet but fairly steady at 2¾d. per lb.

The demand for arsenic continues on very slow lines and values are weak in consequence; white powdered, Cornish makes, is quoted in Manchester at about £44 per ton, round £40 being the current quotation in Cornwall. Sulphate of copper is maintained at £24 10s. to £25 per ton f.o.b., and a rather better demand for this product is reported. Commercial Epsom salts are in fair request at £4 15s. to £5 per ton, with magnesium sulphate, B.P., offering at £6 10s. Acetate of lead keeps firm and in moderate inquiry at round £46 per ton for white and £42 to £43 per ton for brown. Nitrate of lead is steady at £42 per ton. Grey acetate of lime is quiet at £15 per ton, with brown quoted at about £11.

Acids and Tar Products

Tartaric and citric acid prices are about unchanged from last week although a slightly firmer tendency has been reported. Business, however, is still on small lines, with tartaric quoted at 1s. and citric at 1s. 3d. per lb. Acetic acid is less active—the values are maintained at £44 for 80 per cent. commercial and £68 to £69 per ton for glacial. Oxalic acid keeps quiet and easy at 3¾d. to 4d. per lb.

Carbolic acid continues dull at about 6d. per lb. for crystals and 1s. 10d. per gallon for crude. Creosote oil is fairly steady and in moderate demand at 5¾d. per gallon. The demand for pitch is very quiet, with values more or less nominal at 42s. 6d. to 45s. per ton. Cresylic acid is unchanged at 2s. to 2s. 1d. per gallon. Supplies of solvent naphtha are lighter and prices are firmer, 1s. 3½d. to 1s. 4d. per gallon being the current range. Refined naphthalene is selling slowly at £15 per ton, with crude qualities on offer at from £5.

Cellulose Holdings and Investment

The Chairman on Recent Developments

AT the ordinary general meeting of the Cellulose Holdings and Investment Co. in London, the chairman (Mr. A. W. Tait) stated that the balance of profit for the year was £22,244. The directors recommended the payment of a dividend of 3d. per share, free of income tax, which would absorb £13,256, leaving £1,257 to be carried forward.

Dealing with the affairs of British Celanese, Ltd., the chairman said that the position had materially improved. The sales of yarn, which could be regarded as the company's basic product, had steadily developed; the circular knitted fabric plant had now been running successfully for some time, and the orders were in excess of the capacity of the plant, and, in consequence, the plant was at present being increased in capacity by 50 per cent. A woven fabric plant with a capacity of 1,000 lb. to 2,000 lb. per day, according to the character of the fabric, was being installed, a portion of the plant was running, and the remainder would be gradually brought into commission. An interesting development in the use of the yarn was its combination with cotton and wool by independent fabric makers, which had already established an important sale, chiefly in the stocking trade.

In consequence of the increase of output now being obtained, the chairman reported that working costs had shown substantial improvement, and that the difficulties formerly experienced in dyeing the material had largely disappeared. The chairman finally summarised the position by stating that in completed productive capacity and actual output, in variety of product and range of uses, in reduction of costs, in actual sales and market demands, and in financial position, substantial progress can be recorded. He added that the 225,000 ordinary shares in the Midland Counties Electric Supply Company were under option at the price of par for a period of five years, of which there were still three years to run. Within the last few days arrangements had been completed with the holders of the option, under which they had purchased the shares at a price somewhat under par, and arrangements had been concluded at the same time whereby practically the whole of the proceeds had been applied in the purchase of debenture stock at a price which the directors regarded as favourable. When this transaction was completed the debenture stock purchased would be cancelled, and the directors were of opinion that the transaction was to the interests of both the debenture stockholders and the shareholders.

A dividend of 3d. per share, free of income tax, was formally declared; the election of Sir James H. Dunn to the board was confirmed; Mr. A. W. Tait and Sir Maurice Bonham-Carter were re-elected directors; and Messrs. Price, Waterhouse and Co. were re-appointed auditors.

Reorganisation of Norwegian Aluminium Factory

ACCORDING to a report by the American Chemical Society, a reorganisation has just been accomplished by American capital of a great aluminium company in Norway, the Hoyangfaldene. The company has striven against economic difficulties till this year, when some American money was invested in the enterprise, buying half of the aluminium factories, the original company still owning the other half as well as the necessary water power plant. The production is now about 6,000 tons of aluminium a year, and can be increased to 10,000 tons.

Company News

ANGELA NITRATE CO.—An interim dividend of 10 per cent., or 2s. per share, less tax, is announced, payable on November 20.

SANTA CATALINA NITRATE CO.—A final dividend of 15 per cent., less tax, is recommended, making a total of 22½ per cent. for the year.

ANGLO-PERSIAN OIL CO.—The directors have declared a dividend on the ordinary shares of 10 per cent., less tax, for the year ended March 31 last.

WILLIAM GOSSAGE AND SONS (LIMITED).—A final dividend of 2½ per cent. is announced on the first preference shares, making 5 per cent. for the past year.

NORTH BROKEN HILL MINING CO.—Dividend No. 60 of 2s. and a bonus of 2s., making a total of 4s. per share, less tax, have been declared payable on December 8.

BRUNNER, MOND AND CO., LTD.—The directors have decided to pay, on December 18, an interim dividend on the ordinary shares of the company, for the half-year ended September last, at the rate of 7 per cent. per annum.

LASTENIA NITRATE CO.—It is announced that at an extraordinary general meeting held in Valparaiso, it was unanimously resolved to transfer the company's assets and liabilities to the Lautaro Nitrate Co. as from October 31.

ZINC CORPORATION.—The directors announce a dividend of 2s. per share on the preference shares, being the last half of the fixed preferential dividend for 1924, also an interim participating dividend of 2s. per share on both the preference and ordinary shares, payable on January 1, 1925, less tax at 2s. 8½d. in the £.

SANTIAGO NITRATE CO., LTD.—The gross profit for the year ended June 30 last was £17,637. After deducting London charges, etc., there remains a net sum of £12,420, which has been added to £10,196, the amount previously standing to the credit of the profit and loss account, making £22,616. The directors recommend a dividend of 7½ per cent., less tax, carrying forward the balance of £10,616.

BARROW, HEPBURN AND GALE, LTD.—The net profit for the year ended September 30 last amounted to £120,646, and £7,106 was brought forward. It is proposed to pay a dividend on the preference shares at the rate of 6 per cent. per annum for the 15 months ended December 31, 1923, leaving a credit balance of £19,752 to be carried forward. A dividend for the nine months to September 30, 1922, was paid on the preference shares in April last.

BROKEN HILL SOUTH MINING CO.—The net profits for the year ended June 30 were £458,377, and £8,048 was brought forward, while £32,963 excess provision for plant and development was brought into account. Dividends and bonus absorbed £160,000 and £13,333 was added to the sinking fund, and £80,000 appropriated for development leaving £246,055. A dividend of 1s. 6d., and a bonus of 1s. per share, requiring £100,000, were paid in August.

CASTNER-KELLNER ALKALI CO.—For the year ended September 30 last the net profit was £288,052, to which has to be added the balance of £36,331 brought forward, making a total of £324,383. Of this interest on debenture stock requires £7,297, while the interim dividend absorbs a further sum of £80,000, leaving an available balance of £237,086. After placing £75,000 to suspense account, the directors recommend a final dividend of 14 per cent., making 22 per cent. for the year, carrying forward £22,086. The directors consider that the depreciation reserve account is at the present time ample, and they do not propose to add to it on this occasion.

LANGDALE'S CHEMICAL MANURE CO.—The accounts for the year to September 30 last show a profit of £2,826, which, with £110 brought in, makes a total of £2,936. The directors propose a dividend of 2½ per cent., less tax, carrying forward £211. The report states that during the year the company has been compelled to decline many orders which, owing to reduced prices consequent upon increased severity of foreign competition, would have involved heavy loss. The output of manures has been reduced in consequence. The demand for sulphuric acid has been heavily curtailed by the closing down of many coke ovens in the district, which it is feared will continue until there is improvement in the coal and iron industries.

ERINOID, LTD.—Presiding at the annual general meeting on Tuesday, Mr. Andrew Binnia, the chairman, mentioned that the net profits for the year were increased by £10,000, of which £7,000 was due to an increase in trading profits arising out of increased sales. Reviewing the position, he said that there was a large market in France, and the sales there were increasing. Both the English and the French companies were putting on the market a new transparent material for which there should be a large demand. They were very pleased to be associated with that important company, the Casein Co. of America, in the United States. They had provided them with the necessary technical assistance to ensure that they would produce as fine a material as their own. There is an enormous field in the States, and the new company should be a great success.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

AGENT'S SERVICES IN BRAZIL.—A commission merchant of Porto Alegre is desirous of getting into touch with British firms for the sale of cement, red lead, oxide of zinc, and sulphate of copper. (Reference No. 476.)

BALL AND CHINA CLAY.—A firm of importers and agents in San Francisco wishes to communicate with British producers of ball and china clay to obtain agencies for the State of California. Samples and an analysis of the clay should be sent with quotations. (Reference No. 496.)

SULPHATE OF COPPER.—A firm of agents at Bordeaux is desirous of obtaining the exclusive agency for Bordeaux district of British firms engaged in the manufacture of sulphate of copper. (Reference No. 488.)

AMMONIA CARBONATE, FRUIT ESSENCES, ETC.—An agent in Brussels is desirous of obtaining the representation of British firms for the sale of fruit essences, ammonia carbonate, and Colonial products other than gum lacquer for varnish. (Reference No. 487.)

LINSEED OILS AND DISINFECTANTS.—A firm in Havana is desirous of getting into touch with British manufacturers and exporters of linseed oils and disinfectants. (Reference No. 499.)

CREOSOTE OIL, ETC.—Tenders are invited for the supply of creosote oil, pitch, refined tar, paints, varnishes, for Buxton Town Council. Tenders to Borough Engineer's Office by November 15.

SODA CRYSTALS AND SODA ASH.—Tenders for supply of these goods invited by H.M. Office of Works, King Charles Street, Westminster, S.W.1., by November 18.

Tariff Changes

MAURITIUS.—An import duty of Rs. 2 per kilog. has been imposed on indigo, Prussian blue and ultramarine blue when produced in and consigned from the United Kingdom, otherwise the import duty on these articles is Rs. 2.50 per kilog.

UNION OF SOUTH AFRICA.—A Proclamation removes, as from September 26, 1924, the freight dumping duty imposed on super-phosphates imported from Great Britain, Holland, Belgium and Germany. The sales dumping duty on super-phosphates imported from Holland has also been removed.

ROUMANIA.—A new Customs export tax of 5 Lei per 100 kilogs. has been fixed on the following articles:—Chemical products, such as bisulphate of soda, acetate of lead, butylic and propylic alcohol, butyric acid, valerianic, lactic and hydrochloric acids, chloroform, collodion, sulphate of soda, sulphate of aluminium, double sulphate of aluminium and potassium, oxide of zinc, and sulphate of copper.

Hardinge Mill Orders

THE London office of the Hardinge Company announce that in addition to orders received from mining companies, the following orders have been placed for Hardinge Mills for industrial purposes:—Messrs. C. K. Williams and Co., 6 ft. by 22 in. Hardinge ball mill for slate grinding to 200 mesh; the Federal Colour Company, 6 ft. by 22 in. Hardinge pebble mill for grinding bone black 99 per cent. through 300 mesh; the Standard Sanitary Manufacturing Co., 6 ft. by 22 in. Hardinge pebble mill for grinding dry enamel powder; the Pioneer Silica Products Co., 8 ft. by 48 in. Hardinge pebble mill for grinding silica sand 98 per cent. through 200 mesh; and the Western Electric Co., two 3 ft. Hardinge mills.

BRUNNER, MOND & CO.

Limited

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Telephone: 1 *Telegrams: Crescent, Northwich*

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Telephone: Langham 2820/1 *Telegrams: Sesqui, Wesdo*

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BRAND

SODA ASH

Guaranteed 58°—98/99 % Sodium Carbonate

CAUSTIC SODA

Solid: 76/77° 70/72° 60/62°. *Flake:* 76/77°

BICARBONATE OF SODA

Refined and Recrystallised. Guaranteed to conform to the standard of the British Pharmacopœia

PURE SODA CRYSTALS

CREX

A mild alkali. Ideal for laundries

SILICATE OF SODA

All grades for all purposes

CALCIUM CHLORIDE

In various forms

AMMONIUM CHLORIDE (MURIATE OF AMMONIA)

No. 1. Fine White: 99 % *No. 2. Fine: for Galvanisers*

"Voltoids" for Electrical Batteries. *"Salamac" for Tinning and Soldering*

CARBONATE OF AMMONIA

Guaranteed to conform to the standard of the British Pharmacopœia

SULPHATE OF AMMONIA

No. 7

L H A

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ASSOCIATED PRODUCTS, LTD., London, W. manufacturing chemists (M., 8/11/24.)—Registered October 21, mortgaged to Bank, charged on 31A, Denmark Road, W. Ealing. *Nil. October 6, 1923.

CORNHOLME DYEING CO., LTD. (M., 8/11/24.)—Registered October 21, £3,620, mortgaged to Building Society; charged on Glen Dyeworks, Cornholme, and land adjoining; also registered October 25, Trust Deed by way of further charge, and debenture dated October 20, 1924, securing £2,000; charged on property, charged by trust deed dated November 1, 1912, also general charge. *£6,073 19s. 5d. debentures £1,900 13s. 4d. mortgage July 17, 1923.

Satisfaction

MARLEY HILL CHEMICAL CO., LTD. (M.S., 8/11/24.)—Satisfaction registered October 28, £2,000 part of amount registered January 4, 1921.

Receivership

WOOD DISTILLATION (ENGLAND) LTD. (R., 8/11/24.)—H. R. Satow, of 3, Thames House, Queen Street Place, E.C., was appointed Receiver on October 25th, 1924, under powers contained in debenture dated October 24, 1923.

London Gazette, &c.

Company Winding Up Voluntarily

BRITISH OIL IMPORTING & REFINING COMPANY, LIMITED (C.W.U.V., 8/11/24.)—F. W. E. Morgan, Incorporated Accountant, appointed liquidator, October 27th. Meeting of creditors at Capel House, 54, New Broad Street, London, on Monday, November 17th, at 10.30 a.m., creditors claims by November 29th.

Partnership Dissolved

OLIVER & CRICK (late STONHAM & SON) Frederick Josiah OLIVER and Arthur CRICK, wholesale chemists and druggists, and soda water manufacturers, 70, Bank Street, Maidstone, by mutual consent as from August 1st, 1924. Debts received and paid by A. Crick, who will continue the business.

New Companies Registered

F. CHIESMAN AND CO., LTD. Importers and exporters of and dealers in resin, turpentine, pitch, tar and all naval stores, oils, produce and chemicals of all kinds, etc. Nominal capital, £30,000 in 29,750 6 per cent. cumulative preference shares of £1 and 5,000 ordinary shares of 1s. each. Solicitors: Coburn and Co., 6, Draper's Gardens, London, E.C.2.

GEORGE HOLMES AND CO. (HULL), LTD. Bank Chambers, Lewgate, Hull. Oil seed crushers, oil extractors and refiners; manufacturers of and dealers in paints, colours, varnishes, resin, turpentine, soap, manures, fertilisers. Nominal capital, £20,000 in £1 shares.

RICHARDS (ASH VALE), LTD. Dealers in and agents for artificial, chemical and other manures and fertilisers, etc. Nominal capital, £2,000 in £1 shares. Solicitors: Stooke, Vaughan and Taylor, 12, John Street, Bedford Row, London. W.C.

YORSHIRE COAL PRODUCTS, LTD. Distillers, extractors, producers, manufacturers, and suppliers of solid, liquid and gaseous substances, or matter in any way derived from coal or from the derivatives of or residuals obtained from coal by combustion, evaporation, distillation, decomposition, etc. Nominal capital, £100 in 350 participating preference shares of 5s. each and 250 ordinary shares of 1s. each. Solicitors: Ashurst, Morris, Crisp and Co., 17, Throgmorton Avenue, London, E.C.

A Useful Recording Meter Valve

Appliance for Use with Steam, Water or Gases

THE Drayton meter valve is a simple recording device for measuring the flow of steam, water or gas. It is manufactured in standard sizes from 1 in. to 8 in. by the Steam Fittings Co., Ltd., of West Drayton, Middlesex. In its essentials it consists of a disc loaded by means of a cylindrical weight, the latter guided in a cylinder acting as dashpot is arranged to move freely and vertically in a cone shaped bush. In the "rest" position the disc closes the narrowest part of the bush completely. If steam or any other fluid begins to pass, it lifts disc until the excess pressure at its under side just keep disc and weight floating, the liquid passing through the ring area which is formed between the disc and the cone bush. If more fluid passes the disc will rise higher until the difference of pressure below and above the disc is again just sufficient to keep the disc and weight floating. The weight of disc and loading piston being constant, it will float with a constant difference of pressure between its two sides, and it is only necessary to give the cone bush such a shape, that equals lifts of the disc increase the effective passage area equally in order to be able to use the lift of the disc directly as a measurement of the volume of steam passing at any moment at a given pressure.

The quantity of steam passing is expressed by the following equation:—$W = KAyv$, where, W = Weight of steam, A = effective area of flow, y = specific gravity, v = steam velocity, K = a constant.

The lift of the disc is directly transmitted through a lever and shaft to a recording pencil, which draws a graph of the disc positions on a chart mounted on a clockwork driven drum. If it is known what volume corresponds to unit lift of the recording pencil—and this is ascertained by calibration—the distance of the graph from zero line at any given moment indicates the rate of flow at such moment, whilst the surface of the chart between zero line and graph represents the total volume over the recording period which can be measured by a planimeter.

There are various special varieties of the meters available for use with pulsating fluids, or combined with stop valves to save the cost of a separate shutting-off valve.

Research Work in Newcastle

AT a meeting of Armstrong College Council on Monday the following new appointments were confirmed:—Lecturers in Chemistry: E. L. Hirst, M.A., B.Sc., Ph.D., and V. G. Jolly, B.Sc., Ph.D. Dr. Hirst is a graduate of the University of St. Andrew's and was for a year on the staff of the Victoria University, Manchester. Dr. Jolly is a graduate of the London University and this is his first tutorial appointment.

The Council gave consideration to the departmental reports for the last year, and the many original investigations that had been undertaken and completed were the subject of gratified comments. Among these investigations, to which special attention was drawn, was that by Mr. Ray Campbell and Professor W. N. Haworth into the synthesis of amygdalin. The investigation of amygdalin was begun by Liebig and Wohler so long ago as 1832, and since that time chemists in many parts of the world have endeavoured to reveal the constitution of this natural product. Now, not only has this result been achieved in Armstrong College, but its synthesis from elementary sources has finally established the constitution of the most important of all plant glucosides.